SAVE OUR SOUND
alliance to protect nantucket sound

February 28, 2006

Walter D. Cruickshank
Acting Director, Minerals Management Service
Attention: Rules Processing Team (RPT)
Minerals Management Service,
U.S. Department of the Interior
381 Elden Street, MS-4024
Herndon, VA 20170-4817

Re: Alternate Energy-Related Uses on the Outer Continental Shelf—RIN 1010-AD30

Dear Mr. Cruickshank:

On behalf of the Alliance to Protect Nantucket Sound (APNS), I am writing in response to the Minerals Management Service's (MMS) Advance Notice of Proposed Rulemaking for the development of the new regulatory program to implement Section 388 of the Energy Policy Act – Alternate Energy-Related Uses of the Outer Continental Shelf (RIN 1010-AD30). 70 Fed. Reg. 77345-77348 (Dec. 30, 2005). APNS strongly supports the development of renewable energy, and we believe that a well-structured national regulatory program with an ecosystem-based regional approach for site selection will facilitate the development of much needed renewable energy sources, while at the same time ensuring that the marine environment is protected.

The enclosed document sets forth the APNS comments and recommendations on the section 388 program. We look forward to consulting with MMS as it develops the framework for this new program. Thank you for considering these comments, and please contact me if we can be of further assistance.

Very truly yours,

Charles Vinick
President & Chief Executive Officer
Alliance to Protect Nantucket Sound

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396 Main Street, Hyannis, Massachusetts 02601

Tel 508-775-9767
Fax 508-775-9725

www.saveoursound.org
a 501(c)(3) tax-exempt organization

WATERKEEPER ALLIANCE
MEMBER

Alliance to Protect Nantucket Sound

Comments on the Development of a Regulatory Program for Alternate Energy-Related Uses on the Outer Continental Shelf.

RIN 1010—AD30

To Minerals Management Service

February 28, 2006

Alliance to Protect Nantucket Sound

Comments on the Development of a Regulatory Program for Alternate Energy-Related Uses on the Outer Continental Shelf.

RIN 1010—AD30

Submitted to the
Minerals Management Service

by

The Alliance to Protect Nantucket Sound

February 28, 2006

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EXECUTIVE SUMMARY

The new program to implement section 388 of the Energy Policy Act of 2OO5 is the first step toward the type of management of our oceans that the reports of the US Commission on Ocean Policy and the Pew Oceans commissions have indicated is so important. It provides an opportunity to maximize the benefit that the public derives from the shared resources of the OCS, and an opportunity to establish standards that will promote properly sited offshore renewable energy projects while protecting the marine environment. To achieve this result, the program should adhere to the following principles: 1) no individual large-scale project should be reviewed until the program is in place; 2) national standards should be promulgated that guide decisions on site-location, competitive bidding, resource protection, project review and approval, payments, public and state, local and tribal involvement, and decommissioning and removal; 3) a programmatic review of appropriate sites for possible development should be conducted on a regional basis; 4) areas that are not appropriate for development due to economic, environmental and other impacts should be excluded from further consideration; and 5) individual sites should then be available for competitive bidding and project-specific environmental and other review. In developing this program, the Minerals Management Service (MMS) should be guided by the approach used for offshore wind energy development in the United Kingdom and by the Bureau of Land Management for onshore wind.

The program should follow a conservative and environmentally protective approach to access decisions. Leases should be issued to authorize such use, and only after following the five-point plan described above. No project should be exempt from this process. When projects foreclose or restrict competing uses, the initial step should be to find alternative locations that eliminate the conflict. Unavoidable adverse effects for properly-sited projects should be factored into the evaluation of costs and impacts in making a decision whether to authorize the project and for the level of compensation its proponents must pay.

The program should call for the application of the precautionary principle for environmental information, management, and compliance. Under this approach, MMS should require as much information as needed to be gathered regarding impacts on the environment, safety, economics, cultural and historic values, and other values and resources. This is especially important for new and emerging technologies. This principle should be followed at the programmatic and project-specific stages.

The program must ensure a fair return to the United States and the taxpayer. These projects are already heavily subsidized at the federal and state level and no further incentives should be provided in the payment schedule. Competitive

procedures should be used. The environmental, economic and social costs of projects should be taken into account to set minimum prices, and should be accordingly high in areas where there will be significant adverse effects on other uses and values. Projects should be required to pay for the full area they affect, not merely the minimal amount of land area they use. For example, an offshore wind energy plant will affect other activities throughout the entire area within and around the project boundaries, and compensation should be required on that basis.

Coordination and consultation with all affected parties is crucial at every stage of program development and implementation. States, local, and tribal governments must be given a strong role. Because of the public trust nature of these resources, an especially rigorous approach should be followed for public involvement. This is especially true for projects such as offshore wind that have a disproportionate adverse effect on local communities. Project applicants should not be allowed to play an excessive or improper role in the review process, and the program standards should establish clear standards for this purpose. Every effort should be made to locate projects in areas where such conflicts do not arise, and there are abundant opportunities to achieve this goal. There are sufficient resources available for offshore renewable energy development such that conflicts are avoidable, and the goal of consultation and coordination should be to ensure that each of the un-conflicted opportunities is fully explored.

The Alliance to Protect Nantucket Sound believes that, by following these principles, it will be possible to establish a program that ensures the protection of the environment, avoids unnecessary conflicts with competing uses and resource values, while promoting a strong and viable offshore renewable energy industry.

I. Introduction

Concerned citizens living on Cape Cod, Martha's Vineyard and Nantucket, Massachusetts established the Alliance to Protect Nantucket Sound (APNS) in 2002 in response to a proposal to develop the world's largest offshore wind energy facility in the middle of Nantucket Sound. This proposed project would be developed by a company called Cape Wind Associates (CWA). The Alliance serves as Nantucket Soundkeeper, through designation by the national Waterkeeper Alliance, and has responsibility to serve as an advocate of the Sound in terms of maintaining its environmental integrity. Our mission thus includes ensuring the wellbeing of the entire region of water lying between Cape Cod and the islands of Martha's Vineyard and Nantucket.

Since APNS first learned about the CWA project, it has developed considerable expertise concerning the development of offshore alternative energy. Over the past four years, APNS has developed information and arguments regarding the need for a regulatory framework for offshore wind energy, what such a program should look like, and why locations with the kind of sensitivity that Nantucket Sound has should be excluded from consideration in the process of siting offshore wind energy facilities.

APNS supported federal legislation to vest authority for such a program in the Department of the Interior—the result provided for under section 388 of the Energy Policy Act of 2005—because APNS believes in appropriate, environmentally-sensitive development of alternative energy on the outer-continental shelf (OCS). Over the five-year period during which the CWA project has been under consideration, APNS and numerous other parties have not only argued for a statutory source of authority for offshore alternative energy proposals, but also advocated the key principles that should guide federal action. These principles, which now must serve as the basis for the Minerals Management Service (MMS) program, are as follows:

1) No individual, large-scale project should be reviewed until the underlying national program is in place;

2) MMS should develop the underlying national regulatory program, which sets the standards for the authorization of use of the OCS, review of proposals, and control over any facilities;

3) Upon completion of the national regulations, the focus should shift to programmatic, regional resource and site evaluation review;

4) Based upon this review, areas like Nantucket Sound, that are not suitable for development, should be excluded from further consideration; and

5) The regional review should then identify appropriate sites. Those sites should be offered under a competitive bidding, and site-specific, decision-making procedure.

It is against this background that APNS offers these comments on the Advance Notice for Proposed Rulemaking. 70 Fed. Reg. 77345-348 (Dec. 30, 2005)(ANPR). Because APNS's expertise in offshore development lies with wind energy, these comments are written with particular attention to wind energy development, but can, for the most part, be applied more broadly to any renewable energy use of the OCS.

II. Comments

The ANPR requests comments regarding five program areas: 1) access to the OCS; 2) environmental information, management and compliance; 3) operational activities; 4) payments and revenues; and 5) coordination and consultation. The ANPR also lists 36 questions, which have been divided among the five program areas, for which MMS is specifically seeking comment. APNS's comments are set forth under these five program areas, and responses are provided to the specific questions.

1. Are there regulatory regimes, either in the U.S. or abroad, that address similar or related issues that should be reviewed or considered as MMS moves forward with the rulemaking process?

General Issues:

The United Kingdom's (UK) offshore wind program, the Bureau of Land Management's (BLM) program for onshore wind development, and MMS's leasing regime for offshore oil and gas should each be reviewed and considered in developing the regulatory program for offshore renewable energy. Each of these programs follows the principles set forth above. All three have tackled issues that also concern renewable energy development on the OCS, and they support a phased programmatic approach as the optimal approach for addressing those issues.

The UK has implemented a program that MMS should carefully review.[1] The UK program is based on years of experience with offshore wind energy installations

[1] A complete description of the UK's program is available at the Strategic Framework for the Offshore Industry and the Strategic Environmental Assessment (SEA), conducted by the United

and provides useful insights on how to "ensure that the wind industry's potential for development can be realized quickly and efficiently, but in a way which is environmentally responsible"-- the stated goal of the UK program.

After initially allowing small-scale wind projects of up to 30 turbines per site with no constraints on location, the UK determined that an initial national assessment would facilitate development of wind power in a much more efficient and constructive manner while providing for increased environmental protection and safety management. The first phase of the UK program systematically evaluated specific regions for offshore wind development. It identified appropriate locations based on an assessment of wind production viability, alternative uses of areas, and environmental sensitivity. It also established where there were gaps in data that would impact the assessment of all projects in a region and took action to bridge the gaps with studies. The national programmatic assessment further evaluated the major risks and uncertainties of future offshore development and recommended measures to reduce them. It focused on policy-level issues and broad-scale impacts associated with regional development, including issues of cumulative impacts, such as bird mortality, aggregate harm to marine ecology, program-wide visual interference, the possible impact on alternative marine activities, and other issues which varied according to the scale of development in a region.

This approach made it possible for the UK to develop a keen understanding of larger wind resource issues and environmental concerns *before* delving into site-specific evaluations or large-scale development permitting in phase two. In the words of the Department of Trade and Industry (DTI) in the UK, this national assessment "extended the aims and principles of the environmental impact assessment (EIA), which is carried out at the level of the individual project, to decision-making at 'strategic' levels, where alternative approaches and their implications for the environment can more easily and appropriately be considered."

A significant shortcoming was discovered in phase one of the UK approach that should be avoided in MMS's proposed regulatory regime. During phase one, the Department of Transport and its Maritime Coastguard Agency (MCA) were not fully informed and included in the process of approval of the first two offshore sites. Marine and port interests objected that the needs of marine transportation, marine safety, and marine environmental protection were not adequately addressed. This was

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Kingdom's Department of Trade and Industry Energy Group, available at http://www.dti.gov.uk/energy/leg_and_reg/consents/future_offshore/index.shtml and http://www.og.dti.gov.uk/offshore-wind-sea/process/envreport.htm, respectively.

subsequently corrected and resulted in the MCA's publication of the first international set of guidelines for offshore energy installations.[2]

This national look at the issue also translated into "on the ground" practical benefits. It identified opportunities for the wind industry to benefit from sharing of offshore cabling, and co-operative planning for establishing onshore grid infrastructure, while avoiding areas of high conflict and environmental sensitivity. It also provided information that can be used in subsequent project-level EIAs.

Information from phase one also provided the basis for a clear and strategic plan. The UK was able to provide "clear guidance to assist developers to prepare cost-effective EIAs for individual wind farms and establish criteria to assist the competent authorities and other agencies [in making] decisions regarding applications." In short, assessment of the issue from a national perspective resulted in the type of direction and guidance that is so desperately needed for the wind industry in the United States and that was lacking when CWA initiated its pursuit of the Nantucket Sound location. Thus, the UK established that a phased approach starting with a thorough national analysis truly optimizes the use of wind resources in a responsible way.

The U.S. offshore renewable energy program would surely benefit from the same programmatic national approach used in the UK. Indeed, the entity with the most experience in addressing wind development in the U.S.—BLM—has also concluded that such an approach is optimal for managing the development of wind resources. In its Programmatic Environmental Impact Statement (PEIS) for onshore wind published on June 21, 2005, BLM assessed the effectiveness of an overarching programmatic approach, similar to the one implemented in the UK, and determined it would:

- Provide a comprehensive mechanism for ensuring that the impacts of wind development would be kept to a minimum;
- Result in shorter time lines and reduced costs for wind energy projects, thereby facilitating development;
- Ensure consistency in the way applications and authorizations for wind energy development are managed;

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[2] UK Maritime and Coastguard Agency, "Proposed UK Offshore Renewable Energy Installations (OREI) – Guidance on Navigational Safety Issues," MGN 275 (M), August 2004. See Exhibit 1.

- Identify specific areas on which wind energy development would not be allowed;

- Identify the issues and concerns that must be addressed by project-specific plans;

- Establish best management practices incorporating environmentally sound and economically feasible mechanisms to protect and enhance natural and cultural resources consistently throughout the program;

- Determine standard mitigation measures for protecting resources; and

- Reduce the impacts to visual resources—this includes cultural resources that have a visual component (e.g., sacred landscapes). The proposed program would require that the public be involved in and informed of potential visual impacts … ultimately, determinations regarding the magnitude of potential visual impacts would be made by local stakeholders.

The PEIS also assessed the effectiveness of alternative options, including limiting evaluations to a project-by-project assessment. BLM concluded that an overarching, program-wide development plan was the optimal management approach for wind development.

BLM has since issued a final Record of Decision outlining the implementation of an onshore wind energy development program. The program details a comprehensive overarching policy for wind energy development on federal public lands. Much like the UK program, it calls for the identification of "exclusion areas" where wind energy development would not be permitted because of the particular sensitivity of the area on environmental, scenic, historic property or other grounds. Finally, the BLM program calls for the development of standards to govern the wind industry. APNS believes that MMS should review the PEIS and the Record of Decision and follow a similar management program for offshore renewable energy.[3]

MMS also should consider its own approach to offshore oil and gas leasing. Under this system, MMS prepares a five-year program that specifies the size, timing and location of areas to be assessed for leasing. There is no reason for MMS to deviate from that tried and true approach for offshore wind or other renewable energy

[3] The PEIS findings and Final Decision can be found at http://www.windeis.anl.gov.

resources. The UK model shows that this approach works with offshore wind energy. Indeed, both the BLM program and the UK model suggest that a national review followed by regional programmatic assessment provides a solid foundation for a broad strategic plan for wind energy development, and avoids ad-hoc, duplicative assessments on the part of industry and limited protection of environmental resources. The model is an example of how both wind energy industry and environmental concerns can be addressed. APNS strongly suggests that MMS consider all three of these established models and pursue a programmatic national approach for wind energy development on the OCS.

NEPA

The National Environmental Policy Act (NEPA) undoubtedly will play an important role in the development of an OCS renewable energy program. NEPA will apply to the promulgation of the general regulations. It also will apply to the regional programmatic review, as was the case for the BLM approach. Finally, it will come into play for project-specific review. In applying NEPA in this manner, several considerations are paramount.

First, MMS must ensure that applicants are not able to exercise undue control over the review process. There is well-established precedent on the need to screen project applicants from the analytical, policy, and legal aspects of a NEPA procedure, and the MMS regulations should expressly adopt standards for this purpose in addition to existing CEQ, DOI, and MMS guidance.

These standards would include an express requirement to follow CEQ guidelines for the selection of an EIS contractor, if one is to be used, and for the development of a memorandum of understanding (MOU) to define the proper roles of the applicant, contractor, cooperating agencies, lead agencies, and interested parties. The serious problems with the draft EIS prepared by the U.S. Army Corps of Engineers (Corps) for the CWA project are directly attributable to the improper role the applicant was allowed to play. The MMS regulations should ensure that such problems do not arise by including requirements on this issue.

Second, a critical step in the development of an EIS and the formulation of the scope of project review is the identification of the purpose and need statement under NEPA. This statement defines the scope of the EIS and directs the range of alternatives to be considered.

The MMS regulations must specify that the definition of purpose and need is the responsibility of the action and cooperating agencies, not the applicant. Once again, CWA is an example of *how not to* draft an EIS purpose and need statement. In that case, the Corps accepted CWA's flawed legal argument that an action agency

must accept the applicant's purpose and need statement, based upon that party's profit-making motives. As a result, the Corps accepted a statement that, as MMS itself noted in its scoping comments, sounded like a prospectus for the project itself rather than an effective, balanced, federal decision-making document.[4] The result was disastrous, causing the entire NEPA review to collapse upon itself, as manifested by a result-oriented draft EIS that failed to pass muster under all reasonable tests.

The MMS regulations should avoid this problem by mandating that, while the applicant may comment upon EIS purpose and need as may any other party, the ultimate decision be made by MMS *and* the cooperating agencies. In addition, the regulations should provide that the purpose and need statement will be defined by public interest considerations, not by the mere profit-margin goals of the applicant.

Finally, the MMS regulations should recognize that the heart of any EIS is the alternatives analysis. The consideration of alternatives, which naturally flows from the purpose and need statement, must be appropriately broad to encompass a range of project sizes, technologies, and locations. To the extent a regional review is conducted first and inappropriate areas screened out , the more efficient the alternatives review can be in project-specific NEPA analyses. In cases such as CWA, however, where no such review has occurred, a broad and comprehensive consideration of alternatives is required, and the MMS regulations should mandate such an approach.

CWA Issues

The development of the MMS regulatory program raises the issue of whether the CWA project should be allowed to proceed under a separate review, beginning before the national standards are developed or the programmatic review of offshore resources is conducted on a regional basis. The clear answer to this question is "No."

CWA is seeking to build the first offshore wind energy project in the United States and one of the largest in the world. To consider authorizing such a plant before the national program is in place runs counter to every principle of establishing a comprehensive, objective, and effective energy program. Doing so would deprive the public, the state, local governments, and cooperating agencies of the opportunity to

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[4] Barry Drucker of MMS observed on March 20, 2002 that the Corps' EIS process was legally flawed from the outset because the underlying purpose and need statement for the NEPA review "reads like an advertisement for the Windfarm project." The record on this NEPA issue has since been provided to MMS by letter of December 19, 2005 to Deputy Director Walter D. Cruickshank and Dr. Rodney Cluck and is hereby incorporated by reference.

comment in an informed and meaningful way on the CWA program. Such an approach also allows CWA to escape rigorous scrutiny and gives it an unfair advantage over other projects. Most fundamentally, proceeding with any form of CWA review before a fully formed program is in place would prevent MMS from being able to make a fully informed decision that is guided by the standards and a regional programmatic review. It is clear, as noted above, that the CWA plant would never be considered for the current site under a properly designed program. Thus, by allowing the CWA review to start before, or concurrently with, the development of the new program is making possible the application of a controversial and ill-conceived project that should never leave the drawing table. This amounts to a waste of taxpayer resources, forces controversy and conflict, detracts effort from projects in worthy locations, and places an ecologically and economically significant marine ecosystem at risk for no valid reason.

CWA has attempted to argue that certain provisions in the Energy Policy Act of 2005 call for this special treatment. The reasons this position is incorrect are set forth in Exhibit 2.

A. Program Area: Access to OCS Lands and Resources

General Comments:

The key principle at issue in the matter of OCS access is the need to protect the public trust nature of these resources. Offshore renewable energy projects will be developed on public lands, making use of a public resource (wind, waves, tides, etc.), and with the incentives provided by substantial federal and state subsidies that are achieved at public expense. Similarly, the potential adverse impacts are also to be felt strongly by the general public. As a result, the controlling principles that apply to granting access should be dictated by strong public process and participation requirements. Access should be awarded only to sites that do not present negative public trust impacts, and only after rigorous competitive procedures that ensure a return to the public benefit, and after extensive public input and review.

These principles contrast strongly with the approach used by the Corps for the CWA review. The MMS program for providing access to OCS resources must put the public first and avoid the errors that allowed the CWA project review to proceed through a flawed and self-serving process. A well-designed, properly-implemented program for making available access to the OCS will ensure that critical marine ecosystems like Nantucket Sound are fully protected.

Responses to Specific MMS Questions:

2. *Possible development scenarios include phased access rights, which would allow for resource and/or site assessments and research prior to securing additional access rights. Rights could be permitted on a case-by-case basis. Development rights would be secured by a competitive process. An alternative would be to require that interested parties secure access rights to an area prior to conducting assessments and research. Please comment on these possible options.*

As indicated earlier, APNS believes that a phased approach to development, similar to that used by the DTI for wind resource development in the UK, makes the most sense. Although some flexibility may be required to allow for variability among resources and regions, a system such as that outlined below would be the most beneficial in most cases.

a. Consult regionally with potential developers, electric utilities companies, state and local governments, other Federal agencies, environmental groups and key stakeholders to make preliminary determinations concerning (i) areas where there may be potential markets for, and interest in, offshore alternative energy development, (ii) the range, interests, and capabilities of potential developers, and (iii) areas where development would be problematic, controversial, or necessarily precluded to prevent impacting marine protected areas, historic resources, fish and wildlife resources, cultural and scenic values, shipping lanes, marine pollution, marine parks, etc.

b. Develop a national strategic plan to guide development, taking into account applicable law, regional differences in potential resources, development interests, and other information gathered in the course of the preliminary consultations. Components of the plan might include such things as provisions for forming consortiums of potential developers to carry out or contract general site assessments for different resources (similar to that currently being done by geophysical contractors to locate possible oil and gas bearing structures in the Gulf of Mexico OCS).

c. Prepare programmatic environmental impact statements (EISs) on a regional basis according to the NEPA guidelines established by the Council on Environmental Quality (CEQ). Among other things, the initial step – scoping – should seek input from the public to identify concerns and potential controversies regarding possible aesthetic and other impacts that should be considered and addressed. Significant controversies or concerns should be identified during the initial scoping, and public meetings should be held in representative communities to ensure that all views are heard and understood**.** At this stage, a broad approach to alternatives should be used. The goal is to ensure that the full range of projects, based

on size, type of energy, and location, is considered. With abundant resources to choose from, many alternative sites should be available.

d. Identify any uncertainties concerning possible marine safety or environmental impacts and the research that would be required to resolve those uncertainties and to establish adequate baselines for follow-up monitoring. Likewise, the programmatic EISs should identify the prevention and mitigation measures that could or would be required to avoid, minimize or mitigate possible marine safety or environmental impacts and, if there is uncertainty concerning the likely success of those measures, the research that would be required to resolve them. With regard to wind energy projects, for example, the draft EIS prepared for the CWA proposal in Nantucket Sound failed to adequately identify or consider a wide range of impacts.

e. Determine and undertake the most appropriate means for resolving the uncertainties identified in the programmatic EISs – e.g., eliminate high conflict areas; prepare and circulate proposal requests for needed baseline and impact studies and fund those proposals that are appropriately responsive; consult with other federal and with state agencies and cooperatively fund studies addressing common interests; require that prospective developers fund or undertake and provide the results of needed baseline and impact studies as a condition of project authorization; or some combination of these possibilities.

f. Promulgate regulations for implementing competitive bidding or other means for authorizing different types of offshore renewable energy development, and for assessing – e.g., through supplemental EISs – and minimizing or mitigating the possible environmental impacts of individual projects prior to authorizing them.

3. In cases where applicants or interested parties propose activities that would foreclose competing future uses, how should MMS estimate "a fair return" especially if the competing uses would likely be public uses?

MMS should eliminate from consideration those areas in which there exists strong interest in competing public uses, such as Nantucket Sound. These areas most often occur close to shore and in heavily used or environmentally sensitive areas. Locations further offshore hold much greater promise and will be feasible to develop in the near future. In most cases, areas of heavy multiple uses and, more particularly, heavy public use, are incompatible with energy development. Such areas are limited to near-coast areas, and the competing uses cannot be transferred to other locations. Activities such as tourism, marine transportation, commercial fishing, recreational activities, wildlife viewing, recreational fishing, and beachgoing depend on access to near-coastal resources and will be deeply impacted by industrial development. Furthermore, public activities are diffuse in nature and thus can be extremely difficult

to value for the purpose of estimating a fair return. Models do exist, however, and APNS submitted such information in response to the CWA draft EIS. *See* Exhibits 3, 4, and 5.

4. What constitutes a geographical area of interest?

Interest in alternative energy sources is likely to vary from region to region. Likewise, environmental, socio-economic, and political considerations vary as well. Thus, a national approach may be most appropriate to take account of broad political, economic, and environmental variables. Initially at least, assessments with the following divisions would seem most useful for purposes of conducting regional programmatic reviews: 1) Northeast and mid-Atlantic (Maine to Virginia); 2) South Atlantic (North Carolina to southern Florida); 3) Gulf of Mexico; 4) California; 5) Oregon and Washington; and 6) Alaska and Hawaii. In each case, the region should extend from state waters to the boundary of the exclusive economic zone.

5. What assessments should we require prior to competition?

MMS should conduct a national programmatic review as described above prior to competition. A programmatic review will allow MMS to explore alternative approaches and environmental impacts at a level that makes strategic development possible. The UK followed this approach and found it beneficial in identifying environmentally preferred options and areas that should be excluded from development. Following the national review, regional assessment also helped in: producing development guidelines and operations management guidance in relation to a preferred option or specific area; providing information that can be used in subsequent project-level environmental reviews, which are also helped by the earlier identification of environmentally preferred options; assessing cumulative impacts of possible individual projects or actions; and identifying any significant individual or cumulative impacts that may affect other countries ("trans-boundary" impacts).

Renewable energy can be a net public benefit, but only if it is developed strategically. A pre-competition national review will allow MMS to determine which general areas would be optimal for wind or other renewable energy development and which should be closed to such activities. This would be accomplished by considering the prevalence of renewable energy sources and the viability of energy production, as well as the advantages of alternative uses and environmental considerations. Rather than having renewable energy companies invest resources in exploring options that are not viable for environmental or other reasons (as in Nantucket Sound), such an assessment would make it possible for them to concentrate efforts on areas that make sense from wind development *and* public benefit

perspectives. A regional assessment approach will allow MMS to get the most public benefit from public waters.

6. How should MMS structure the competitive process and the application process used to issue OCS access rights? Should MMS auction access rights or engage in direct negotiation?

To maximize return to the public for use of the OCS public lands, MMS should auction leases. In the offshore wind energy context, the limiting resource is location. A number of factors make certain locations more feasible and profitable than others, including water depth, wave height, environmental conditions, proximity to shore, proximity to a grid that can accommodate the power generated, etc. In most cases, the more attractive a location from the perspective of the developer, the greater the impacts of development at that site on the public – i.e., such sites are usually close to shore. Thus, to ensure that fair market value is obtained for such a lease, MMS should employ an auction, rather than direct negotiation. APNS notes that while section 388 does not require MMS to offer locations selected by CWA and the Long Island Power Authority (LIPA) on a competitive basis, if such sites are offered at all, section 388 *does not prohibit* the Secretary from auctioning such sites.

The regulations also should ensure that access is not awarded for speculative purposes. For projects like CWA, there is strong concern that the applicant involved lacks the financial capability to actually develop the project. Instead, the motivation for pursuing the project could be to gain access rights and then transfer ownership of those interests to a third party to achieve significant windfall benefits and financial gain. The regulations should guard against this kind of result by requiring proof of financial capability to develop a proposed project at the outset of the application process. In addition, parties awarded access should be prohibited from transferring those rights to any third party in the absence of additional public review and decision-making.

7. Should MMS take a broad approach to developing a program, or should efforts be targeted to specific regions?

As noted above, MMS should develop a national program through regulations of general applicability, which would then be applied on a regional basis to evaluate sites, assess impacts, preclude sensitive areas, and proceed with development.

8. How should MMS consider other existing uses when identifying areas for access?

See answer to Question 3.

9. How should MMS balance existing uses within an area with potential wind and current energy projects?

See answer to Question 3.

Yes, MMS must look at conflicts between existing uses and proposed development. In some locations, such as Nantucket Sound, existing uses will provide an insurmountable hurdle for proposed energy development. As the OCS is a public resource, existing public uses should be given great weight when considering various sites for a project, particularly when alternative sites with less conflicting public use are available. To assess this, and to balance competing interests with the aim of maximizing the public benefit derived from the OCS, MMS must look broadly at alternatives when it assesses a project. It must determine the relative public value between the existing uses of the area (which should be defined broadly to include environmental, cultural, historic, and scenic values, as well as competing uses for transportation, recreation, fishing, and the like); in addition, that balancing should take into account the ability to transfer the conflicting uses to other locations. In that regard, it will be impossible to transfer existing uses in most cases, whereas the proposed project development generally can be located in an alternative location.

10. Should MMS require permits for collecting data from vessels? Should we consider this information proprietary? What criteria should we use for holding the information proprietary?

Most existing U.S. Coast Guard (USCG) and Corps data collection for vessels should prove adequate. The need for permits from vessel operating companies, port interests or port authorities should depend upon the nature, location, and duration of the data collection activity. For example, if high-energy sounds are to be used to assess bottom topography or other relevant variables in areas where, and at times when, marine mammals, sea turtles, or endangered fish species may be present and possibly affected, authorization in accordance with the relevant provisions of the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA) may be required. Similarly, authorization must be obtained from the USCG if the activity could interfere with shipping, and from the Federal Aviation Administration if activities, such as balloon releases to measure wind speeds and directions, could affect aircraft operations.

As a basis for both regional assessments and specific site/project evaluations, the UK recently published a model for assessing marine navigational safety risks for

offshore wind energy projects.[5] As the guidelines state, the model can be used or adapted for use for offshore renewable energy facilities other than wind energy. A major component of this risk assessment model is the collection of present-time data, as well as the projection of future conditions defining how vessels use a particular waterway. Marine company operating plans as well as projected plans for the future may prove sensitive in nature. The USCG should be consulted on both the need and the means for obtaining and publishing such information.

Data that are collected by potential developers should be made publicly available. This program would make use of public resources for energy development, and resulting data should be shared with the public. Only limited information that truly qualifies as proprietary should be withheld. For example, one kind of data that must be made public is wind speed data. Wind speed information is in no way proprietary. It is based on the characteristics of a public resource, and it is fundamentally important to determining how efficient a wind plant will be and what its capacity is. In the case of CWA, however, the applicant has refused to release this information gathered for its so-called data tower located on the public trust lands of the OCS. In fact, the Corps did not even review these critically important data in preparing the DEIS. MMS should insure that certain data that has direct bearing on evaluating project benefits such as wind speeds, are shared with both the lead agency and consulting parties so that project benefits claimed by a proponent are clearly justified.

11. What criteria (e.g., environmental considerations, energy needs, and economics) should MMS consider in deciding whether or not to approve a project? What criteria should MMS consider for different competing projects (i.e., wind versus current) for the same site?

MMS should consider a number of criteria in evaluating whether to permit a project. At the base of all these criteria should be adherence to the "precautionary principle" under which a cautious approach is made to decision-making to ensure that protected resources and values are not placed at risk. They should include:

- Conflicts with areas of special significance, such as Nantucket Sound, where the conflicts, cost, controversy and impacts of project review cannot be justified. Under this criterion, areas of high conflict should be eliminated from consideration at the outset;

[5] UK Department of Trade and Industry (DTI), CAPT Colin Brown (Project Manager,) "Guidance on the Assessment of Impact of Offshore Wind Farms: Methodology for Assessing Marine Navigational Safety Risks of Offshore Wind Farms," 12/20/05.

- State and local government concerns. The position of affected state and local governments should control as to whether a site is considered. Renewable energy projects have localized impacts, and thus, if affected, and state and local governments are opposed, the area involved should not be made available for development;

- Environmental, economic and other costs and impacts of the project. Depending upon site selection, these projects can have anywhere from negligible to very significant impacts. These effects must be fully evaluated and used as a screening criterion. High cost and impact areas such as Nantucket Sound should be precluded. In addition, this evaluation of costs and benefits could be used to compare alternatives. The full range of impacts must be taken into account, from oil spill risk to avian impacts to scenic impacts to effects on the local economy. Models should be run, such as oil spill fatality maps, to predict environmental impacts;[6]

- Impacts to historic, cultural, scenic, and other protected values. This issue is discussed in more detail below. In general, projects should be located so as not to conflict with such values;

- Safety considerations. Minimum safety criteria should be developed. For example, projects within 1.5 miles of shipping lanes should be prohibited;

- National security concerns. No project should be located in areas where national security risks would arise;

- Adequacy of data and the validity of the assessments of possible impacts on birds, bats, marine mammals, sea turtles, fish, fisheries, etc. If existing data are unavailable, or inadequate, project review should not proceed and the applicant should be required to gather the necessary information;

- The likelihood that proposed and required monitoring and mitigation measures will successfully:

    i) prevent or mitigate possible adverse environmental and public safety impacts, such as impacts on commercial shipping; commercial fishing; passenger ferry; recreational boating; recreational fishing; general aviation; radar effects; interference with military installations; oil spill

[6] For example, oil spill risk analysis should be conducted for the CWA project for purposes of Corps review. See the reports at Exhibit 4.

potential; homeland security; vandalism; nuisance; ice throw; structural integrity of and visual impacts on historic properties, aesthetic resources, etc.,

and

ii) detect possible unforeseen and unacceptable impacts in time to mitigate them; and

- The ability of the site to lend itself to mitigating measures. Some locations, such as Nantucket Sound, contain such a wide array of conflicting uses and values that mitigation is impossible or impractical. Locations where mitigation is not possible should be excluded from further consideration.

The answer to this question could easily go into far greater depth for each of these criteria. Rather than do so for each criterion, ANPS offers the following example regarding the effect of a project on historic and cultural values.

MMS, like every other federal agency, has an affirmative responsibility under the National Historic Preservation Act (NHPA) to do its part in preserving the nation's significant historic, cultural, and heritage sites that may be affected adversely by its actions. It is imperative that MMS recognize that its responsibilities under the body of historic preservation laws are now called into practice with the advent of its expanded responsibilities under the ANPR program.

It will be necessary for MMS to fully embrace the requirements of both Sections 106 and 110 of the NHPA, and the Proposed Rule which MMS is preparing must acknowledge these legal requirements. Briefly, Section 106 requires MMS to *"take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register."* This provision would apply to any permits issued by MMS for energy facility siting – such as for wind generation – on the OCS, for example.

Section 110 generally requires MMS to *"assume responsibility for the preservation of historic properties which are owned or controlled by such agency."* This provision would apply, for instance, to cultural landscapes or seascapes that have been included in or are eligible for inclusion in, a National Register listed site or district. This would be especially important for any sites that are recognized as being nationally significant, National Historic Landmarks (NHL), or the cultural landscapes or seascapes associated with their history.

Of particular importance is Section 110(f) of the NHPA, which states that *"[p]rior to approval of any Federal undertaking which may directly and adversely*

affect any National Historic Landmark, the head of the responsible Federal agency shall, to the maximum extent possible, undertake such planning and actions as may be necessary to minimize harm to such landmark, and shall afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the undertaking."

This latter provision in particular requires MMS to assure that whenever a proposed energy facility on the OCS would visually intrude on or impair an NHL, or its cultural landscape setting, alternative locations not only should be considered, but must be chosen unless there is an overwhelmingly compelling reason not to do so. Given the vastness of the OCS, this is a highly reasonable approach for the MMS to adopt as a solution that will avoid many potential conflicts in the future.

At a minimum, in the context of the proposed ANPR, the Program Area for Environmental Management and Compliance must be expanded to directly address MMS's responsibilities under the NHPA, and clear provisions must be made for consultation with the Advisory Council on Historic Preservation, and with other federal agencies, such as the National Park Service, which administers the National Register and NHL programs.

As a preferable course of action, MMS should develop a separate section of its rules and policies to directly address all of its legal requirements under the NHPA, which are quite different from its other environmental requirements. Finally, the MMS compliance and permitting process must clearly address alternate facility siting as the primary means to mitigate adverse impacts from such energy development as wind, solar, or wave energy.

Another example is avian impacts. This is a critically important issue for offshore wind projects. Strict standards should be established to ensure that project applicants gather sufficient information prior to MMS review and that no projects are approved if the risk to avian species is uncertain or unacceptably high. It is particularly important in this regard that there be mandatory compliance, required by regulation, with the U.S. Fish and Wildlife Service (FWS) guidelines and the three-year data gathering standard.

This is the kind of consideration that needs to be applied to each of the issues identified above. Virtually all of these issues are subject to their own laws and regulations, and the MMS regulations must include requirements that will ensure that all of these protected resource values are fully and adequately addressed.

B. Program Area: Environmental Information, Management, Compliance

General Comments:

MMS should look to the European experience and collect as much data as possible regarding the impacts of offshore energy development on the environment, visual resources, and safety and economics on a programmatic basis, before proceeding with individual project review. Without question, the UK experience will assist MMS in identifying those program details that will help to prevent conflicts, mitigate impacts, decrease controversy, and facilitate development. For example, key features of the UK guidelines are:[7]

1) Identification and application of goals and/or acceptance criteria reflecting the general public's and/or the government's desires;

2) Collection and analysis of data for both current and future states of the proposed facility and the impacts on its environment;

3) Determination of prevention and mitigation actions that are tied to and flow from the results of a risk assessment;

4) Definition and application of distinct levels of tolerance in determining the acceptability of negative impacts and/or the actions necessary to mitigate an impact to an acceptable level; and

5) Implementation of a complete management system and analysis beginning with defining safety and environmental baselines, identification and application of threats, determinations of specific impacts through the future inspection and evaluation of the enforcement, continued applicability and effectiveness of a mitigation measure plan.

While the UK guidelines were designed for application to proposed offshore wind energy plant facilities, they can be readily adapted for other offshore renewable energy projects. The USCG, for example, should evaluate the application of similar guidelines in their requirements for, and review and acceptance of, a marine risk assessment for alternative offshore energy projects. MMS should, in turn, defer to the USCG on such standards.

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[7] UK Maritime and Coastguard Agency, "Proposed Offshore Renewable Energy Installations (OREI) – Guidance on Navigational Safety Issues," MGN 275 (M), August 2004. See Exhibit 1. UK Department of Trade and Industry (DTI), CAPT Colin Brown (Project Manager), "Guidance on the Assessment of Impact of Offshore Wind Farms: Methodology for Assessing Marine Navigational Safety Risks of Offshore Wind Farms," 12/20/05. Provided to MMS at February 22nd, 2006 meeting.

Marine risk assessment principles should be evaluated and applied in the regional assessments and in site-specific/project evaluations. The USCG should issue the standards and be designated as the marine safety and marine environmental protection review authority. The MMS should adopt these standards.

In addition, in the ANPR, MMS also indicates that an environmental management system will rely on an adaptive management strategy that gathers and uses information, including monitoring and evaluation of activities and their environmental consequences. While APNS supports the use of adaptive management strategies, they are not a substitute for conducting primary research and should not be an excuse for approving a questionable or problematic project. As noted previously, the underlying MMS decisions must be based upon the precautionary principle so that sensitive resources and protected values are not placed at risk. MMS must still conduct thorough and detailed investigations regarding the suitability of a site for development and the impacts development will have on coastal resources under this principle. A "trial and error" approach relying on adaptive management to address problems that are likely to arise in the future is highly inefficient and will likely result in devastating impacts to irreplaceable coastal resources. This must be avoided at all costs. For example, CWA argues that it should be allowed to proceed with project review despite the absence of adequate information on avian impacts. It relies, in part, on adaptive management as a fallback, arguing that it will deal with problems after the project is built. Obviously, such an approach should be rejected when adequate research, data gathering, and impact assessment can be conducted before a decision is made.

Although knowledge of ecosystem function is often inadequate to provide clear answers to management dilemmas, MMS should refrain from development in areas where there is significant concern, and should allow development only where it is reasonably confident that environmental, economic, safety and visual impacts will be low and amenable to prevention and mitigation measures. MMS should employ an active adaptive management approach whereby it conducts a systematic process of modeling, experimentation and monitoring to develop region-specific policies. Management performance can be maximized only if regulatory effects can be predicted reliably. Thus, MMS must conduct an iterative cycle of monitoring, assessment, and decision-making to clarify the impacts of development. At this stage of the program, MMS must begin with lowest-risk development so that it can develop a proper understanding of alternative energy technologies and the attendant environmental costs of such development in the offshore environment.

Responses to Specific MMS Question:

12. What types and levels of environmental information should MMS require for a project?

As indicated earlier, MMS also must evaluate the adequacy and reliability of the data used to make its determinations and, in cases where there is significant uncertainty, MMS must identify the additional data needs and either undertake or require prospective developers to undertake the studies necessary to meet those needs.

The UK marine risk assessment guidelines[8] provide for an assessment not only of safety impacts but also of marine environmental pollution impacts from a proposed offshore facility. These principles and their information requirements should be evaluated and applied in a national review of potential offshore sites, in regional assessments and in site-specific/project evaluations.

An especially high level of information should be required for particularly sensitive areas. As noted above, areas like Nantucket Sound should be deemed entirely off-limits for use. To the extent sensitive areas or resources are involved, the burden should be placed upon the applicant to gather sufficient information to address all areas of uncertainty before project review considers authorization for the relevant location.

The types and levels of environmental information that should be required are prescribed in NEPA, CEQ's implementing regulations and guidelines, MMS's standards, and other applicable laws such as the ESA, MMPA, Clean Water Act, Magnuson-Stevens Fishery Conservation and Management Act, National Marine Sanctuaries Act, and their implementing regulations. For example, NEPA requires that EISs generally should include descriptions of the potentially affected environment, particularly those biotic and abiotic components that could be affected by the proposed action, and assessments of the likely direct and cumulative impacts of the proposed action on the potentially affected components. The ESA prohibits federal activities that could jeopardize species or damage or destroy critical habitats of listed species, and requires consultation with either the National Marine Fisheries Service (NMFS) or FWS and preparation of a biological opinion if an action could adversely affect a listed species or its critical habitat. The MMPA prohibits taking of marine mammals that would cause any species or population to be reduced or maintained below its optimum sustainable level, and provides that taking of small numbers can be authorized if it will have negligible effects on the affected species or

[8] UK Department of Trade and Industry (DTI), CAPT Colin Brown (Project Manager), "Guidance on the Assessment of Impact of Offshore Wind Farms: Methodology for Assessing Marine Navigational Safety Risks of Offshore Wind Farms," 12/20/05.

population. It therefore follows that, as part of its responsibilities, MMS must ensure that sufficient information is available to make these and other determinations required by applicable laws and their implementing regulations. The specific data requirements will vary by issue but should be thorough in every instance.

Detailed requirements should be established for all project impacts. Rather than provide criteria for each such resource, APNS offers an example of such standards for purposes of evaluating impacts to benthic resources. To assess the issue of benthic habitats, benthos, and associated ecosystems and communities, MMS should require:

- A thorough, clear, and competent characterization of pre-development benthic communities, including infauna and epifauna, benthic fisheries (invertebrate and vertebrate), benthic habitats, and Essential Fish Habitat (EFH), with descriptions compatible with the Tier 3 study standards;[9]

- Baseline surveys that include organisms inhabiting submerged aquatic vegetation (SAV) habitats if such habitats are present in or adjacent to the proposed development area;

- Benthic community characterizations that consider seasonal variations and are supported by seasonal sampling efforts as appropriate to the environment for which the project is proposed;

- Benthos characterizations that include competent taxonomic evaluation;

- A map presenting clear delineation of benthic habitat types, their occurrence and spatial extent, including hard bottom, bottom relief, SAV by species, and sediment characteristics of sand, mud, gravel and rock/rubble habitats;

- SAV maps that differentiate species mixes and densities of SAV;

- Competent and serious evaluation of impacts of all stages of species development on SAV habitats, including evaluation of secondary impacts on species utilizing these habitats seasonally or throughout the year;

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[9] Gibson, G.R., M.L. Bowman, J. Gerritsen, and B.D. Snyder. 2000. Estuarine and coastal marine wars: bioassessment and biocriteria technical guidance. EPA 822-B-00-024. USEPA Office of Water, Washington, DC. Available as of February 28, 2006 at http://www.epa.gov/waterscience/biocriteria/States/estuaries/estuaries1.html.

- Clear bathymetric maps indicating depth profiles to scales that may be readily superimposed over benthic habitat maps;

- Maps indicating the locations and sizes of both commercial and recreational benthic fishing grounds, with differentiation between the two, and indicating the species or types of fisheries pursued at each of the fishing areas illustrated;

- Overlaying of the actions, procedures, activities, and conditions associated with project construction, operation, and removal of facilities, onto the documented baseline conditions in order to interpret changes that may be anticipated due to implementation of the development project;

- Maps documenting the locations and amount of the bottom that will be disturbed, as well as the causes and extent of the disturbance. These disturbances should be competently analyzed to forecast resulting changes in benthic communities and recovery rates that may be anticipated;

- Analysis of all construction and operational plans to determine whether they are the least environmentally intrusive procedures that may be employed, or whether viable alternatives exist;

- Analysis and reporting of impacts on a quantitative basis whenever possible. Claims of "no effect" or "minimal effect," or "merely local effect," or "temporary effect," should not be accepted without clear substantiation, and should be quantified whenever possible to enable realistic and effective evaluation by permitting decision-makers and the public;

- Analysis of impacts on commercial and recreational benthic fisheries, including fisheries for invertebrates (e.g., clams, lobsters, shrimp, and conch) and finfish (e.g., sole, flounder, halibut, and other benthic fishes associated with the bottom substrate);

- Analysis of creation of new habitat, such as vertical pilings, to forecast the kinds of fowling communities that may be expected to utilize these new surfaces, and to anticipate both the negative and positive effects that these new communities may have on fish communities or on other ecosystem components;

- Inclusion of the intertidal benthic community in all analyses whenever components of the proposed development cross the land-water interface;

- An analysis of the proposed means of transmitting generated power to shore, which generally requires laying of cable. Many assertions have been made claiming that "jet-plowing" is the best, least environmentally intrusive means of burying cable in some bottom types, but little information or evidence seems to be available to justify these claims. These assertions should be tested by competent and documented studies in a variety of habitats and under a variety of conditions (e.g., sea state). Unsubstantiated claims should not be accepted as evidence when proposed developments are under evaluation;

- Clarification and discussion of sampling plan rationale, sampling and sample handling, laboratory analytical and statistical evaluation methods and procedures, in a manner sufficient to enable evaluation of the quality of resulting data, information, and interpretations; and

- Clear and thorough presentation of QA/QC practices followed in the development of data and information.

13. What types of site-specific studies should MMS require? When should these studies be conducted? Who should be responsible for conducting these studies?

The types of site-specific studies that should be required will depend, in large part, upon the nature, magnitude, and location of the proposed action. Likewise, when, and by whom, the studies should be conducted will be determined in part by the nature of the activity. It is important, however, in terms of timing, that all environmental baseline and impact studies be conducted and approved *prior* to issuance of a draft EIS, and that site- and development-specific monitoring studies be implemented following construction and before permitted operations begin. More generally, MMS should be responsible for acquisition of data needed to perform a national review, preparation of a programmatic impact assessment, and regional monitoring to ensure that authorized activities do not have unforeseen adverse effects. On the other hand, developers generally should be responsible for conducting pilot and other studies necessary to assess the feasibility and likely site-specific environmental impacts of proposed development projects. In certain locations where development is promising and not subject to significant conflicts, pilot projects may be appropriate.

Developers also should be responsible, as a condition of their development authorization, for conducting and providing to MMS the results of studies, such as a marine navigational risk assessment, necessary to evaluate the likely utility of proposed or required site-specific prevention, monitoring and mitigation measures and to ensure that the available baseline data provide an adequate basis for detecting

possible unforeseen consequences and to confirm the validity of any assumptions upon which the required site- and activity-based impact assessments were based.

In some cases, responsibilities might be shared by MMS and one or more potential developers. Depending upon available resource data and apparent or possible limited development interest, it might be appropriate for MMS or a single prospective developer to conduct regional or site-specific studies to identify areas where wind or the other alternative energy sources could be conducive to development. In cases where there is substantial uncertainty and multiple potential developers, it might be in the best interest of the potential developers to form a consortium to share the cost of the initial resource assessments.

On a related matter, it is important to keep in mind that other federal agencies, state agencies, and private entities may be conducting basic research and impact, mitigation, and monitoring studies of relevance to the MMS mission. As an example, both the Navy and NMFS have collected baseline information and are monitoring the vital parameters of selected marine mammal, sea turtle, and fish populations in many areas where alternative OCS energy development may be likely. MMS should consult these agencies and organizations, and where feasible coordinate or develop cooperative data collection and analytical programs. The USCG should issue the guidelines and be designated as the marine safety and marine environmental protection review authority.

14. What should be the goals and objectives of monitoring, mitigation, and enforcement?

The goal of monitoring or prevention should be twofold: (1) to confirm the validity of any assumptions made in the programmatic review, regional assessment and site-specific impact evaluations, and (2) to detect any unforeseen impacts in time to take remedial action to prevent them from reaching unacceptable levels. The objectives likewise should be twofold: (1) to ensure that the pre-development baseline data accurately portray conditions prior to development, and (2) to ensure that the monitoring program is capable of meeting its goals.

The goal of mitigation should be to ensure that possible impacts do not rise to unacceptable levels, by instituting measures to either limit or ameliorate the scale or degree of impacts. Mitigation efforts should also be designed such that the public and resource managers are confident that the value of the proposed development is not outweighed by the value of the environmental resources lost. Sufficient mitigation should be imposed such that the environmental cost of development is not too great to justify the benefits of the project causing those losses. The objectives should be to (1) identify measures that are practical and will meet the goal, and (2) confirm that the

measures are successful by pre-development evaluation, post-development monitoring, or both.

The goal of enforcement should be to ensure compliance with lease stipulations and required monitoring and mitigation measures. Enforcement should also strive to be sufficiently effective so as to deter undesirable behavior by the developer, and be perceived as such by the public to maintain public confidence and support for well-designed energy programs.

15 What types of impacts are of concern? What are effective approaches for mitigating impacts? How can mitigation effectiveness and compliance with Federal environmental statutes be assessed?

The determination of prevention and mitigation measures should flow from the application of a risk assessment methodology[10] for marine assessments and obviously would depend on the types of impacts involved. Both prevention and mitigation measures should be linked with specific risks or threat scenarios so that their applicability, appropriateness and effectiveness over time can be evaluated. Some of the more serious concerns associated with offshore wind, for example, involve impacts to birds and bats, impacts on benthic species, impacts on marine mammals and other marine fauna including fish, impacts on safety, navigation, marine pollution, aviation, and radar operations, and impacts to visual and historic resources. Most of these impacts can be minimized through prevention by carefully selecting the sites for offshore wind energy development to avoid areas of conflict. When projects like CWA are not screened out initially, as they should be, then detailed and extensive impact studies in all of these areas are required and must be performed at the applicant's expense.

Where impacts lead to the violation of federal laws, including the ESA, MMPA, and the Migratory Bird Treaty Act, the best result is to deny project approval. This can be achieved at the outset by proper site selection screening. In other situations, where a project is developed, all necessary steps should be taken to eliminate the effect, including cessation of operations. The applicability of these federal laws and the consequences of necessary mitigation measures emphasize the need to make well-considered and carefully researched siting decisions. In addition, the USCG should issue marine guidelines and be designated as the marine safety and marine environmental protection review authority, to include regional and initial site

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[10] See UK Department of Trade and Industry (DTI), CAPT Colin Brown (Project Manager), "Guidance on the Assessment of Impact of Offshore Wind Farms: Methodology for Assessing Marine Navigational Safety Risks of Offshore Wind Farms," 12/20/05.

evaluation. Marine risk assessment guidelines should require developers to prepare and maintain prevention and mitigation plans that would undergo an initial review and periodic validation.

Finally, it is critically important that MMS provide for the complete and vigorous analysis of cumulative impacts. Clearly, such an approach is required under NEPA. To avoid uncertainty or confusion, however, the MMS program regulations also should mandate a cumulative effects analysis. This should begin when the regional review is conducted, and the cumulative effects analysis at that stage should be used to disperse project sites to eliminate undesirable cumulative effects. Further cumulative effects reviews, as provided for under NEPA and other applicable law, should then apply at the project approval phase.

16. What regulatory program elements lead to effective enforcement of environmental requirements?

The key elements of an enforcement program are: 1) clear requirements and policy; 2) uniform application of the requirements; and 3) active auditing to ensure that the requirements continue to be met.

The OCS facility program for oil and gas facilities provides a good example of the application of these elements. An offshore alternative energy generation facility must significantly adapt to be successful and safe in a marine environment. As an example, requirements must address the unique and dynamic demands on support structures as well as for operating machinery. Consideration must be given to using recognized standards for the design of structures and machinery. One marine classification society (Det Norske Veritas) internationally has issued such a standard.[11]

General regulations and requirements must be issued and uniformly applied on a national basis. As an example, the USCG should issue national standards for the review and approval of the marine safety and marine environmental protection aspects for a proposed facility. These standards could either be applied in a review process by USCG national experts or by the various Captains of the Ports located in major coastal communities.

[11] Det Norske Veritas, "Design of Offshore Wind Turbine Structures," DVN Offshore Standard DNV-OS-J101, June 2004 (available as of February 28, 2006 at: http://exchange.dnv.com/OGPI/OffshorePubs/ViewArea/OS-J101.pdf).

The inspection and enforcement program should strike a balance between direct oversight of requirements by federal and state (depending on facility location) authorities, and by recognized or certified third-party inspection experts. Similarly, a balance must be struck between the performance of physical inspections and review of audit documents under a recognized quality program.

Federal agencies are called upon to look out for the best interests of the environment, and to be the counterweight that prevents private interests from exploiting federal resources to the detriment of the public. A national review of benefits and impacts, independent of corporate influence, helps to ensure that the public interest is properly addressed. Information gained during the national assessment will allow MMS to develop assessment regulations in a strategic and consistent manner across projects. It can also help to inform both the MMS and the industry of the most vulnerable and potentially controversial sites.

Ongoing assessments are also paramount. Each new wind energy project will mean more industrial development in our public waters. It is important that, in an attempt to be strategic over the long run and to get the most public benefit from those waters, there be an ongoing data collection program. As part of the pre-competition assessment, MMS should identify gaps in scientific data needed to make informed project assessments and take action to fill in the gaps going forward. MMS could require ongoing monitoring by wind projects on issues such as bird mortality rates from turbines in the region, or MMS could sponsor independent studies on issues like bird migration routes in the area or marine mammal impacts. As gaps in scientific data are filled, mitigation efforts on existing plants can be taken and future project assessments will be more informed. MMS will be in a position to properly protect the public interest.

More specifically, regulatory program elements to provide for effective enforcement should require:

- Evaluation and specification of construction equipment and practices with monitoring;
- Unannounced inspections;
- Aerial surveillance;
- Documented authority to halt construction or operations to require compliance;
- An emergency response fund;

- Environmental monitoring with auditing of the monitoring program and records;

- Bonded funding to pay for eventual equipment removal;

- On-board observations of construction methods; and

- Performance standards to delineate minimum benefits that a project must provide, and maximum impacts allowable.

Finally, to be truly effective, the regulations must include performance standards that are tied to the issuance of permits. Enforceable criteria should be developed for all projects, either in the regulations themselves or in lease terms and stipulations. These are the standards against which the operation of specific projects will be evaluated and for which the enforcement tools listed above will be used.

17. How should environmental management systems be monitored (by the applicant, the MMS or by an independent third party)? What should be the MMS roles versus the roles of industry for ensuring appropriate oversight and governance?

Effective monitoring depends upon availability of adequate baseline data against which to benchmark changes; creation of this baseline should be an objective of the EIS, which is the responsibility of the applicant. As in other existing development scenarios, a DEIS should be produced for review and comment by interested parties, and the entire process should be open to public challenge if efforts are deemed inadequate.

Monitoring programs should be conducted by an independent third party or consultant, and should be funded by the applicant/developer as a normal cost of doing business. In some cases, it may be appropriate to establish an independent advisory group to oversee this function, especially for large-scale or regional projects. The applicant, other stakeholders, and MMS should have input into the selection of the monitoring party. From the selection point forward, however, the applicant should exercise no administrative role in supervision of the monitoring. Monitoring reports should be submitted to MMS, and invoices submitted to the applicant/developer. The applicant should retain the right to observe and audit monitoring methods and conclusions, or even to conduct parallel monitoring, and to seek redress if required. MMS should independently observe and audit monitoring efforts.

C. Program Area: Operational Activities

General Comments:

Operational considerations are an important part of the MMS program. The national regulations should insist upon the gathering and submission of all relevant operational data at the outset of project review at applicant expense. Projects should not be allowed to go forward when sufficient data have not been gathered, and because of the emerging nature of these alternative energy technologies and the absence of adequate information in certain areas, it is necessary to err on the side of full data-gathering before review can proceed. This is especially important in the safety area.

Please refer to our responses to questions #15 and #16 regarding issues of marine safety and environmental risk analysis, and structural design standards and inspection, respectively.

The MMS program should recognize that the marine review and permitting of pilot projects should be subjected to a marine risk analysis under guidelines issued and administered by the USCG.

The OCS oil and gas program contains health, safety and environmental resource protection provisions that should be considered for this regulatory regime. In addition, the unique safety and emergency aspects of search and rescue (SAR) responses to incidents occurring in or around offshore wind facilities need to be evaluated. The MMS program should recognize, and the USCG should publish, guidelines that account for the additional operational and navigation risks and communication needs for such a response .[12]

Furthermore, the MMS program needs to recognize, and the USCG needs to issue, guidelines that would require project applicants to assess and account for increased risks of marine pollution resulting from collisions between ships and offshore facilities containing large numbers of structures.[13]

Finally, the MMS program needs to recognize the shortcomings inherent in, and encourage research in areas pertaining to, safety, security and protection of the environment. Areas where current knowledge is still lacking, for example, are the design and construction standards for offshore towers, machinery and support

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[12] See, for example, UK Maritime and Coastguard Agency, "Proposed Offshore Renewable Energy Installations (OREI) – Guidance on Navigational Safety Issues," MGN 275 (M), August 2004. See Exhibit 1.

[13] See, for example, UK Department of Trade and Industry (DTI), CAPT Colin Brown (Project Manager), "Guidance on the Assessment of Impact of Offshore Wind Farms: Methodology for Assessing Marine Navigational Safety Risks of Offshore Wind Farms," 12/20/05.

structures, the attenuation of radar interference produced by wind energy projects, and the construction and installation methods for deepwater moorings.

Responses to Specific MMS Questions:

18. What options should MMS consider as alternatives to facility removal? Are there unique issues (such as liability) associated with those options?

In general, such facilities should be entirely removed. The costs of decommissioning removal and full-site remediation must be taken into account at the beginning of the project review to determine if a proposal is viable. In addition, bonding to cover the full cost of this action must be required upfront from the project developer.

19. What engineering challenges should be considered when operating in an OCS environment?

Offshore wind energy has been implemented in Europe with mixed success. Salt air, continuous moisture, wind, high waves and wave-swept water particles have strongly corrosive effects on turbines. Icing is another problem in northern locations. By early 2005, only 600 MW of offshore wind capacity had been grid connected, in six different European countries. Throughout 2005, only two offshore wind projects were to be completed, both in the UK – Kentish Flats and Barrow. Most facilities are less than 10 years old, and the life span of such facilities is not yet well understood. The corrosive offshore environment has caused some problems for wind energy projects, including at Horns Rev, where all 80 turbines had to be removed and reconditioned at shore because of major technical problems at a cost of roughly ten million dollars.

An additional consideration is the development of deepwater technology, which is far less environmentally damaging and visually intrusive than projects closer to shore. In the Moray Firth, approximately 70 kilometers north of Inverness, eastern Scotland, engineering company, Amec, is installing deepwater wind energy turbines in 45 meters of water. The turbines will be located near the Talisman's Beatrice oilfield and existing infrastructure. This technology is believed to be close at hand and must be considered as a viable alternative for all offshore wind projects that present conflicts closer to shore.

Again, the CWA project is a perfect example of why deepwater alternatives must be considered. While it is unlikely the CWA project can ever be permitted, financed, or built, even under the best case scenario it would not be operational for a period of time such that, by all reasonable predictions, deepwater technology would be available to move this project off the coast of New England to less-conflicted sites.

Thus, review of the CWA project now is inappropriate in anticipation of the near-term availability of sites farther offshore. At the very least, such sites must be considered as alternatives to the Nantucket Sound locations.

Research in the UK has revealed that offshore wind energy projects produce electronic interference to radar used for vessel navigation and identification as well as for aircraft detection and guidance. Ongoing research in the UK for air operations and the means to attenuate this interference needs to be monitored and reflected in this regulatory regime. Research and examinations need to be instituted on the question of navigation radar interference. Until such problems are resolved, MMS must prohibit projects in any location where such operational problems would arise. For example, UK studies clearly establish the risk of projects located within 1.5 nautical miles of significant vessel traffic due to radar interference.

20. What safety issues exist when operating an energy production facility on the OCS?

Numerous safety and environmental protection issues exist with offshore wind energy facilities, particularly when located in the near-shore environment. Among the issues that must be considered are:

- proximity to commercial and general aviation airports;
- navigation risk to shipping and marine transportation activities;
- marine pollution risk from safety mishaps between ships and facilities and between ships avoiding facilities, from interference with commercial radar operations, and from oil transformer substations;
- interference with vessel marine radar, and interference with military radar installations;
- strength and reliability of towers and/or support structures to resist the dynamics of a marine environment including collisions from ships and ice loading, ice throw and ice flows;
- air traffic control rotor breakage;
- impacts on search and rescue operations in areas of heavy commercial and recreational boating use;
- interference with traditional fishing operations;

- interference with recreational boating and fishing activities; and

- security threats, and potential for breaking and entering/vandalism.

21. How should operational activities be monitored (e.g., annual on-site inspections with verification of operating plans)? Is there an appropriate role for the applicant and independent third party certification agents? Describe existing models that could serve as a prototype inspection and monitoring program.

Please refer to our responses to Questions #15 and #16, and Part C – General.

Because of the highly corrosive environment in which offshore wind facilities will be operating, operational activities should be monitored with particular focus on safety considerations, including potential for rotor breakage and structural integrity. A third-party certification agent would be an effective means of implementing a monitoring program. There should be ongoing monitoring of operational impact on the environment including, the sloughing off of paint/metals from corrosion and bird mortality rates from turbines.

22. Are there special considerations that MMS should examine in developing an inspection program that covers a diverse set of renewable production facilities? If so, what are they?

Please refer to our responses to Questions #15 and #16, and Part C – General.

MMS should consult with the USCG and other concerned agencies to identify a set of common parameters that would lend themselves to an inspection program applicable to all of these offshore facilities. As an example, placarding, navigation lights, portable firefighting equipment, and life-saving equipment are safety elements that should be inspected and that should be the same or similar among the varied installations. Additionally, MMS should impose safety and pollution prevention requirements unique to a particular installation and propose their inspection method, interval and limits in a facility inspection and maintenance plan. This plan could be separate from or combined with a facility prevention and mitigation plan.[14]

MMS, in conjunction with the USCG and other concerned agencies, should consider and encourage recognized third-party organizations to develop and implement a quality oriented inspection and certification program for offshore

[14] See UK Department of Trade and Industry (DTI), CAPT Colin Brown (Project Manager), "Guidance on the Assessment of Impact of Offshore Wind Farms: Methodology for Assessing Marine Navigational Safety Risks of Offshore Wind Farms," 12/20/05.

alternate energy installations. Det Norske Veritas, a leading ship classification society, has developed such a standard and program for offshore wind facilities.[15]

D. Program Area: Payments and Revenues

General Comments:

MMS has stated that the proper standard for determining what requirements regarding compensation for the use of the OCS should be included in proposed regulations, along with the leases, rights-of-way and easements granted pursuant to those regulations. APNS agrees that MMS has the responsibility to ensure a fair return to the United States. APNS also believes that section 388 of the Energy Policy Act requires that the revenue and payment structure must account for the interference that any permanent activity on the OCS causes to other uses of the waters and ocean floor where these activities occur.

By way of introduction, APNS believes that setting up a proper revenue and payment structure is crucial in assuring that uses of the OCS represent the highest and best use. Microeconomic theory reveals that in a competitive market, price will determine whether the person using a resource is actually putting it to its highest use. Therefore, the minimum price that should be charged is that price derived from an open market. Of course, MMS is aware that auctions for property interests on the OCS do not always generate competition, even in the relatively mature market for oil and gas leases. In addition, non-exploitative uses generally have not been permitted to compete against the exploitative uses that the leasing statute contemplates. Even if they were permitted to compete in an auction, while a generator of electricity has a means of getting funds from the users of the electricity, a person or group that enjoys a view, or participates in sporting or other activities for which there is generally no market, will not be able to assure that the consumers who benefit from the lack of obstructions will participate in providing funds for the auction.

Therefore it will be the obligation of MMS to determine these social costs and to set minimum prices for the use of resources. In our view, this would require the setting of minimum rentals and royalties prior to bonus bidding, with minimum bonus values also being set by MMS taking into account the potential for other bidders in the future and the value of alternative, non-exploitative uses of the area where leasing is being proposed.

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[15] Det Norske Veritas, "Design of Offshore Wind Turbine Structures," DVN Offshore Standard DNV-OS-J101, June 2004 (available as of February 28, 2006 at: http://exchange.dnv.com/OGPI/OffshorePubs/ViewArea/OS-J101.pdf).

We believe that permanent fixtures for the production of energy that would preclude or restrict other uses of the affected area on the OCS are properly viewed as being subject to a leasehold interest. For example, in the case of the CWA project, the lease should cover the entire 24-square-mile area. On its website, MMS has correctly defined a lease as a legal agreement between the landowner (the United States) and the person who desires a right to exploit the premises for certain productive uses for a specified period of time.

An easement or a right-of-way is more properly used for the transportation purposes of the lease. The transmission grid should be considered together with the generation project, although there is no reason that the project owner should necessarily also own the transmission lines. Any transmission lines, like pipelines for transportation across the OCS, should provide open and non-discriminatory access to other producers of electricity. These lines should be licensed under a right-of-way, subject to oversight by MMS (as well as by the appropriate state or federal electric transmission licensing agencies). Such lines should pay a rent based on the land area disturbed and the fact that the electromagnetic fields in their vicinity may cause damage to marine animals and plants.

A person who desires to use the OCS for the generation of energy from sources other than oil and gas would require exclusive use of certain acreage for this purpose. For example, if a person desired to erect windmills, to take advantage of normally prevailing winds in some location, that person would not only need to lease the sea floor under the footprint of the windmill, and under the direct current lines between the turbine and the transformer, but would also need to have exclusive use for some distance around the facility. They would need this right, if for no other reason than to prevent another party from erecting a facility near to their windmill that would block the prevailing winds. In addition, such a facility, if developed over a wide area, will preclude or severely restrict other activities that normally had free and full use of the location.

In areas like Nantucket Sound, those other uses are extensive, frequent, and diverse. Certainly, such factors should be taken into account in determining areas like the Sound to be off-limits to development. But to the extent such locations are allowed, payment should be for the full area of restriction. In the case of the CWA project, for example, the affected area of use would be the 24-square-mile zone occupied by the project.

Responses to Specific MMS Questions:

23. What should the payment structure be designed to collect? Should payments be targeted at charging for use of the seabed? Should payments try to

capture the opportunity costs of other activities displaced by the activity? Should the payment structure be designed to capture a portion of the revenue stream, and if so, under what circumstances?

There are two factors that are important to consider when designing a payment structure: the interference with other uses, which is measured by the area that a project occupies, and the benefit to the project owner (or to its competitors in a fair and open auction), which is measured by the amount of energy produced. Therefore, payments should be targeted both at charging for the use of the sea floor while preventing other competing uses within the pelagic zone and in the atmosphere above the water surface, and at capturing the revenue stream. A sensible manner in which to accomplish these goals would be to use a payment structure similar to that employed by the Department of the Interior with respect to oil and gas leases.

In the oil and gas program, MMS charges a rental, to account for the land area being held by the lessee during the period prior to the commercial exploitation of the federal resource. That rental is converted to a minimum royalty once the development of the resource has become commercial. However, should the resource be a more than minimally productive resource, a royalty tied to the revenue stream is charged, if it exceeds the minimum royalty.

This structure has economic advantages and, if properly set, will help to achieve the goal of efficient use of the valuable federal resource of the OCS. By setting a rental equal to the value of the resource for the next best use (the opportunity cost in your questions), which could be use by another alternative energy lessee, MMS would be assuring that the person holding the resource and preventing others from using it would be the best economic use of the resource. If MMS had perfect knowledge, or there were perfect markets, this rent would probably be sufficient to assure that the federal government was properly compensated. However, perfect knowledge and perfect markets only exist in textbooks.

Because MMS (like anyone else) cannot know what the opportunity cost is with a high degree of accuracy, it is logical to use a revenue-based system to assure that it is capturing the appropriate economic rent from the use of the federal resource. Only if that rent is captured can MMS assure that it is meeting the statutory mandate of a "fair return to the United States."

24. Offshore renewable energy technologies are in their infancy. Should the payment structure be designed to encourage the development of these activities until the technologies are better established?

The United States already subsidizes the development of alternative sources of energy, and Congress neither mandated nor allowed MMS to add to the existing

subsidies to encourage development offshore, rather than onshore. There are already several factors that may contribute to a developer's preference for developing alternative energy offshore.

These factors include the lower relative distance from windy offshore sites to coastal population centers, the reduced turbulence and steadier wind offshore, and the relative ease of shipping and erecting larger turbines with larger blades in a location where there are no road limits or legal barriers to larger machines.

There is also apparently no need to structure payments to encourage early adoption. The General Land Office in Texas recently signed a lease for about 17.75 square miles seven miles off Galveston Island, which the developers hope will produce 150 MW of electricity. That lease provides for market-based compensation to the State (at least during the productive phase), with a base rent of $10,000 per year and a royalty of 3.5% of gross value of electricity or by-products from the leased premises (before deductions) for the first eight years, 4.5% for the next eight years and 5.5% for years 17 though 30. The lease is for 30 years, once production begins. While we believe a more significant payment requirement is necessary for federal lands, this example demonstrates that there is no need to provide additional financial incentives to develop these projects for purposes of rental and royalty payments.

Subsidization through the royalty structure is not an efficient or effective means of encouraging new technologies. Were MMS to attempt to encourage energy development in a particular area by decreasing the cost of the resource, the most logical effect of this type of subsidization would be to move projects from one location (state waters or onshore) to another (federal waters). If states, like Texas, believe that it is reasonable to allow development in their state waters, or if onshore landowners are willing to allow economic development on their land, MMS should not reduce the price below what those landowners would charge, or below the true economic value of the resource.

Were MMS to encourage the premature development of a resource (which would be any development that occurs prior to the time when the market would otherwise develop that resource), the user of the resource is likely not to make the best use of the resource. For example, today the cutting edge offshore wind generator appears to be the 3.6 MW turbine manufactured by General Electric. That generator is a major improvement (at least 50%) over the generators manufactured just two years ago. If MMS were to decrease the rental structure to encourage early development, it is likely that less efficient generators would be placed in the most valuable resources.

It should be obvious that the most valuable resources would be developed first. If a developer has the choice of two locations, one of which either costs more to build upon, including the costs of getting the electricity to shore, or produced less electricity during the course of a year because the winds were not as favorable, clearly the developer would choose the more valuable location first. Any developer with reasonable knowledge of these factors will rank potential developments according to the net economic benefit, and will choose the location that yields the highest profit. Therefore, the best locations will be taken first, unless MMS is able to account for the relevant factors (quality of wind and costs of development) in setting the appropriate rent and royalty structure. As the costs of alternative energy are heavily weighted to the capital costs of constructing a project, putting the oldest technology in the best locations and subsidizing them so that they will be placed there before it is efficient to do so meets none of the goals of the alternative energy use of the OCS program of section 388.

25. What methods are used by the renewable energy industry to quantify the risk and uncertainty involved with estimating the size of a renewable energy resource, and evaluating its profitability?

The National Renewable Energy Laboratory and the American Wind Energy Association both have done extensive work on the economics of wind energy, including the uncertainty inherent in developing a renewable energy resource. There has been enough experience to know what the major risks are. They include 1) damage to the generating station or the transmission network by storm winds and waves, ship collision, salt corrosion, etc.; 2) winds that fall outside the optimum speeds for which the turbine and blades are designed; 3) mismatches between supply and demand due to deviations in wind speed; 4) financial risk when the project is not being developed by an investor-owned utility.[16]

Measurement of profitability is no different for the renewable energy industry from the measurement for other industries. However, due to the capital-intensive and subsidized nature of the industry, the most important measures must consider depreciation, interest and taxes. A project should be considered to be profitable if it returns a positive present value of net revenue, considering development costs, construction costs, transmission costs, depreciation, operations and maintenance,

[16] Ryan Wiser and Edward Kahn of Lawrence Berkeley Laboratory have estimated that ownership by an investor owned utility would reduce the total costs of generating wind energy by approximately 30% due to the decreased cost of capital, which is entirely due to decreased risk to investors. See "Alternative Windpower Ownership Structures: Financing Terms and Project Costs" (1996, LBNL-38921).

other ordinary expenses (taxes, royalties, overhead, etc.), improvements and decommissioning, weighed against the gross revenue from the sale of electricity and from subsidies and tax incentives already awarded.

26. What measures of profitability are commonly used as renewable energy investment decision criteria? How do bonus bids, rents, royalties, fees and other payment methods impact the profitability of these projects?

The measures of profitability of renewable energy projects are no different from those of any other investment. An investor will want to see a net cash flow and sufficient earnings after interest, depreciation, taxes and royalties to make the investment worthwhile. As there is no experience in this country with offshore wind projects, and as there are no projects anywhere in the world that have gone through a life-cycle from planning to decommissioning, there is still uncertainty regarding the long-term prospects for these projects. Therefore, an investor is likely to insist on *pro forma* profitability projections in excess of those normally enjoyed by conventional electricity generation projects.

Currently, developers that have expressed an interest in developing offshore alternative energy projects are small, closely-held limited liability companies or corporations. They do not seem to be well capitalized and are likely to need to go to the capital market to acquire the capital necessary to plan and build an offshore alternative energy project. Whatever costs are imposed on them for the use of the resources of the United States will decrease their profitability. This should be of no concern to the Interior Department when it is acting as the landlord for the OCS. The experience of the MMS in having undercapitalized lessees on the OCS has not been a favorable one. Having a revenue structure that decreases the likelihood of such undercapitalized companies attempting to develop a project on the OCS only to abandon it before the life-cycle of the project is complete is not something to fear.

On the other hand, MMS should expect that bonus bids will not be an accurate measure of the value of the federal resource of which MMS is the steward. As alternative energy projects are capital-intensive undertakings, and as the developers do not appear to be existing profitable ventures, there will be more opportunity to collect appropriate economic rent over the course of the project, rather than as an up-front bonus bid. In one situation, the lease between the Texas General Land Office provides for no bonus, a $10,000 annual fee in lieu of rent, and production royalty equal to between 3.5% and 5.5% of gross revenues, with minimum annual royalty of between $616,000 and $1,064,000. This structure, while not necessarily appropriate for the federal government, demonstrates that the project is more able to compensate the lessor for the value of the resource during the time that the resource is being used to produce energy.

27. Are there economic models available to calculate the profitability of renewable energy proposals?

The National Renewable Energy Laboratory in Golden, Colorado, through its National Wind Technology Center, and the Office of Energy Efficiency and Renewable Energy of the United States Department of Energy, have developed several economic models to calculate the profitability of renewable energy proposals. Probably the easiest to use is the online Wind Energy Finance (WEF) model. The user inputs data about the project including general assumptions, capital costs, operating expenses, financing assumptions, tax assumptions, assumptions regarding financial constraints and other economic assumptions, and the model will generate the minimum energy payment to meet financial criteria, a level cost of energy, the payback period, the net present value of the project, an internal rate of return and a summary with detailed cash flows.

28. Increased reliance on renewable energy offers both economic and environmental benefits. What are the public benefits to society and do they differ from market driven benefits?

The Alliance recognizes that renewable energy offers many potential benefits to society that may not be recognized by financial criteria. Those benefits have been listed by the American Wind Energy Association as including decreased reliance on fossil fuels or nuclear power, each of which has well-known social costs; reduced environmental impacts, including decreased production of greenhouse gases; and long-term income to the landowners on whose land the wind energy projects are built. However, these benefits will occur regardless of the location in which the alternative energy project is built (and the last one requires a reasonable return to the landowner). At the same time, when projects are located in inappropriate locations such as Nantucket Sound, the costs to society readily outweigh the benefits. In addition, backup electricity requirements for wind projects must be considered when assessing project costs and benefits taking into account when wind facilities are not producing energy.

29. In section 8 (p) of the OCSLA as amended by Section 388 of the Energy Policy Act, the Secretary must require the holder of a lease, easement or right of way granted under that subsection to furnish a surety bond or other form of security. What options should MMS consider to comply with this requirement?

Again, MMS's experience with sureties in the oil and gas program should be used as the foundation for an alternative energy surety program. A developer of alternative energy must provide a surety sufficient to assure that all decommissioning costs will be borne by the developer and not the taxpayer. Unlike an oil and gas lease,

which traditionally is granted for as long as the lease is producing in paying quantities, an alternative energy lease only becomes more productive over time because more energy will be produced in the future, given the logical improvements in alternative energy technologies, than would be produced at the beginning of a lease. To assure that the federal resource is always being devoted to the highest and best use, leases should be for a fixed number of years and the existing structures must be removed to make way for more productive technologies (unless the current owner is the high bidder on any recompetition of the lease).

Sureties should take similar form to existing oil and gas lease or appeal bonds. A company should be able to demonstrate financial capability of assuring that decommissioning will be paid by the lessee. Alternatively, the lessee could have a bond, or an irrevocable letter of credit, for the term of the lease, plus about five years to assure that decommissioning occurs, sufficient to pay all the costs of decommissioning. The lessee could also purchase liquid assets, such as government bonds, sufficient to cover the needed costs, and assure MMS, either by giving MMS physical possession or title, that the assets could not be used for other purposes. Given the likelihood that lessees of alternative energy leases are less financially solvent than the typical OCS oil and gas lessee, it is particularly important that these sureties be sufficient to cover the likely decommissioning costs. This is especially true in that there will not be a continuing asset for MMS to sell to another party. The turbines and blades will wear out, and it is uncertain how long even the monopod structure will last, given the relatively short time these developments have existed offshore. If the lease also expires, as we are recommending, assuring the best use of the resource and the best return to the United States, then there will be few substitute companies in the alterative energy industry that will be willing to purchase a lease near the end of its term.

In addition, MMS should not presume what the ownership of a project will be. For example, it is possible that ownership of all parts of a project will be consolidated among related entities, as in a typical geothermal steam project. On the other hand, because of the difficulty in raising capital, it is possible that alternative energy projects on the OCS will resemble oil and gas ventures, with farm-outs, many interest owners, and division of the leasehold estate by turbines and towers, etc. In any case, MMS should insist that the lessee remain the party primarily responsible for any royalty, for damages to the environment and other users of the surrounding sea, and for decommissioning and removal costs. MMS should also insist, through the lease instrument and the regulations, that any person who owns any portion of the project be jointly and severally liable with the lessee for royalty, damages and decommissioning costs of the portion of the project that they own. In starting the process of leasing for alternative energy and other uses, MMS has the opportunity to assure compliance with its legitimate needs by the structure it sets in this rulemaking.

MMS should not structure this process in such a way as to have any of the same problems, as rare as they are, that it has had with the oil and gas leasing program.

E. Program Area: Coordination and Consultation

General Comments:

Coordination and consultation is essential for all phases of offshore renewable energy program development and implementation. This coordination must be extensive and open to the public. In addition to relevant federal agencies, strong deference should be accorded to state and local governments. In many cases their views should control, especially in circumstances where the impacts of larger-scale projects will be visited almost exclusively on particular local communities and economies. The greater the impact, the stronger the degree of deference they should be given.

For example, in the case of the CWA project, a situation is presented where the developer is seeking to build a massive project in the "hole-in-the-doughnut" of Massachusetts state waters. In addition, the area involved is critically important to local government economies. There is no comparable situation anywhere in the United States. In all other cases, such development may be offshore of state waters, but not surrounded by them. In the Nantucket Sound case, therefore, the state and local governments of the Cape and Islands should be given a role tantamount to co-lead agency.

The U.S. marine transportation, marine safety and marine environmental protection needs on the OCS are a unique national priority, and development and implementation of the MMS regulatory program must be coordinated with the USCG. Where proposed offshore development may impact marine safety or marine environmental protection, the USCG should issue marine guidelines and be designated as the marine safety and marine environmental protection review authority for national programmatic review and for regional and site evaluation. These guidelines could either be applied in a review process by USCG national experts or by the various Captains of the Ports located in major coastal communities. A similar role should be provided on specialized topics for other agencies, such as FWS for avian impacts, NMFS and the New England Council for Fisheries, EPA for pollution, etc.

In addition to the specific needs related to marine safety, coordination and consultation and resource-specific concerns, it is extremely important for purposes of dealing with the general public. These tools are valuable to: gather information; seek ways to minimize conflict; find acceptable alternatives; identify mitigation; and inform the public. APNS cannot stress enough the importance of extensive and timely consultation. The methods for such consultation should be spelled out in the

regulations themselves. At the same time, restrictions should be imposed on the role of project developers to ensure that they do not gain an inside track to bias agency decision-making. This problem was the fatal flaw of the Corps' review of the CWA project, and MMS should be sure to avoid the same problem.

Responses to Specific MMS Questions:

30. While MMS considers this ANPR an appropriate start at consultation with interested and affected parties, what other efforts could be undertaken at this early stage of program development?

MMS should conduct public hearings in New England and work directly with the communities that have been dealing with offshore wind proposals for a number of years. For example, the project proposed by CWA has been extraordinarily controversial, contentious and ill-conceived. There is much that can be learned from this project about how *not to run* an offshore energy program and conduct site-evaluation. Had proper scoping occurred at the outset, development never would have been allowed to be considered in Nantucket Sound, and MMS should now come to that conclusion before further effort is invested in the CWA project review.

In addition, conducting public hearings in New England will help MMS educate the public regarding the new program, how existing projects will be reviewed, and inform members of the community how MMS's approach will differ from that of the Corps. Because the review process with the Corps was so deficient and contentious, holding public hearings now will help rebuild the public trust.

31. Should a broad approach be taken to developing a program or should efforts be targeted to specific regions with commensurate coordination and consultation?

MMS should adopt both approaches, but in different contexts. It is necessary to adopt a broad national approach to developing an overall regulatory program that will promote informed and consistent federal decision-making. For that purpose, it is necessary to conduct broad-based consultation efforts, as MMS has done through the ANPR and with concerned agencies such as the USCG, FWS, NMFS, and the affected state and local governments.

Once the regulatory framework is complete, however, MMS should perform a national programmatic review process with a regional evaluation for site-selection and other purposes, and when that is completed consider individual projects. Again, broad-based consultation and coordination should be used.

32. Would the establishment of Federal/state cooperatives for targeted areas be useful? Similar to the process for OCS oil and gas program formulation, should we solicit comments on which areas of the OCS should be included or excluded from the program? After establishing where there is consensus in support of program activities, should coordination and consultation efforts be directed to those areas? Conversely, should such efforts be curtailed or abandoned for areas recommended for exclusion?

MMS should establish federal/state/local government cooperatives for targeted areas. Comments should be solicited on which areas of the OCS should be included and which areas should be excluded. Because the OCS is a public trust resource, it is critical to develop a consensus in support of program activities and abandon areas recommended for exclusion. Through this approach, MMS will be better positioned to account for and balance the public interest in OCS resources.

33. What are the critical stages (e.g., site evaluation, application, competitive sale) for consultation with affected parties?

Site evaluation is the most critical time for consultation with affected parties. It is during this period that MMS will identify where development is appropriate and where it is prohibited. In conducting careful consultation during this phase, MMS can avoid considerable controversy by identifying those resources that are most heavily valued from the public perspective so that development can be excluded from such areas. In permitting developers to use and occupy the OCS, the multiple interests of the general public in those resources must be carefully balanced against the economic interests of developer. It is during this time that MMS can look at the entire area at once, determine what level of development is appropriate, and what restrictions are necessary to protect the environment and preserve the public interest. By eliminating inappropriate areas from consideration, through public consultation, MMS will avoid the considerable controversy that has plagued some offshore energy proposals.

In addition to avoiding controversy, clear regional assessment of site selection would better position MMS to evaluate and mitigate impacts of development. It is also very important to provide for consultation during individual project review.

34. Should procedures for consulting with interested and affected parties be codified in the regulations? In general? In detail?

MMS should establish procedures for consultation with interested or affected parties. These requirements should be in the regulations. Given the importance of coastal resources to a tremendous number of people, and the environmental, economic and visual impacts of near-shore development, MMS should define "interested" or "affected" parties broadly. Offshore energy projects have the potential to significantly

impact valuable public trust resources, and MMS's consultation provisions should reflect the importance of these resources.

MMS should establish public consultation procedures at three stages of review. First, consultation is critically important during MMS's development of the national standards; next, it is essential for the regional programmatic review; and finally, it is very important for site-specific project evaluation. One of the fundamental failures of the Corps during its review of the ill-conceived CWA section 10 permit was its failure to consult openly and widely with stakeholders. APNS encourages MMS to not make the same mistake.

During MMS's programmatic review of specific areas for development, for example, MMS should provide initial notice that it is considering an area for renewable energy development. That notice should describe what information it will consider in determining which areas within the specific zone will be available and for what types of development. MMS should conduct hearings and provide a 120-day comment period to allow the public to identify those areas in which development should be prohibited and why. This comment period should not significantly delay MMS's evaluation of environmental impacts, as the agency can conduct preliminary studies during the comment period. After conducting the necessary research, MMS should issue a draft EIS identifying the areas it intends to open to development. A 180-day comment period provides adequate time for the public to comment on MMS's proposed approach. After processing the public comments, MMS should circulate a final EIS with development areas identified for a 90-day comment period.

As with programmatic review, consultation with interested or affected parties should be conducted through public hearings and comment periods for individual applications. In addition to those periods set forth under applicable environmental statutes, MMS should provide notice of an application for an offshore energy facility and establish a 120-day comment period. In addition, MMS should issue a notice of a proposed decision and accord the public a 60-day opportunity to comment on the agency's proposed decision. These periods can be coordinated with public comment periods set forth under NEPA and other applicable environmental statutes. All time periods should be subject to extension when needed.

In addition to formal comment periods, mandatory procedures should be spelled out in the regulations for consultation with affected parties. State agencies and local governments should be cooperating agencies, as should affected tribal governments. Meetings with other stakeholders should be encouraged.

Finally, as important as it is to define who should be consulted with, so too should it be made clear that project applicants will *not* be allowed to play an

inappropriate role in the evaluation of information, formulation of alternatives, interpretation of law, and making of decisions. The failures of the Corps' review are due, in large part, to the excessive role CWA was allowed to play in the project review. The MMS regulations should ensure that such improper influence and excessive involvement is prohibited.

35. What processes can MMS use to provide for balance between consultations and the time and burden to the projects?

By conducting a national programmatic review of areas being opened for development, MMS will significantly reduce the time involved in reviewing individual applications and its own administrative burden in processing such applications. A programmatic review is the single most effective step toward expediting properly-sited offshore energy development. Further, if MMS works with affected states and local governments during the programmatic review process to identify areas that are off-limits to development, the subsequent consultation burden will be significantly alleviated.

In addition, MMS can balance the need for consultation with the burden to the project by coordinating comment periods set forth under section 388 with those already applicable under NEPA, the ESA, the National Historic Preservation Act, the Coastal Zone Management Act, and other laws. Developers have successfully implemented projects under these laws for years. For example, comments on individual applications could either coincide with a notice of intent to prepare an EIS (as will be necessary for any offshore energy project of significant size), or could provide consultation after comment on the notice is closed. Because NEPA review is a fairly extensive process, sandwiching consultation between NEPA comment periods does not result in any delay to an applicant.

36. Are there specific aspects of the new ROW rule issued by the Bureau of Land Management that should be reviewed by MMS for consideration in its rulemaking?

Numerous aspects of BLM's Right-of-Way (ROW) rule should be considered as MMS conducts its rulemaking. *See* Record of Decision, *Implementation of a Wind Energy Development Program and Associated Land Use Plan Amendments*, Dept. Interior (Dec. 2005). The aspects of the BLM onshore program that should be carried forward into the offshore program are described below.

First, and most importantly, as BLM has determined, MMS should not issue leases for offshore development in areas of the OCS where the proposed development is incompatible with specific resource values. Thus, OCS areas that have the same type of values as have been protected under federal laws for the land-based equivalent

– i.e., wilderness areas, wilderness study areas, national parks and monuments, wild and scenic rivers, and national historic and scenic trails – should be off-limits to development. Designation of such areas through programmatic review will help to prevent controversy and protect precious coastal resources.

Unfortunately, the United States has not yet developed as sophisticated a set of protections for coastal and OCS resources as it has for land, due to the lack of development taking place offshore to date. Thus, in considering areas in which alternative-energy OCS development would be incompatible with specific resource values, MMS will necessarily have to make determinations without the benefit of clearly designated resources, as those designated under the National Landscape Conservation System. Areas designated as national marine sanctuaries will obviously be off-limits to energy development. So too should those areas that have been proposed for national marine sanctuary status, areas that qualify as marine protected areas under the definition in Executive Order 13158, 65 Fed. Reg. 34909 (May 31, 2000), areas that have been designated by states as deserving of heightened protections, and areas that contain national historic landmarks and other historic properties that would be affected by a project, be ruled off-limits to development.

Likewise, MMS will have to evaluate certain locations that are not federally protected to determine whether alternative energy development would be incompatible with resources contained therein. BLM has identified certain areas where development should not occur because adverse effects could not be mitigated (*see, e.g.*, Exhibit 6). The coastal zone is an immensely important environment for numerous avian and aquatic species. Just as BLM has prohibited development in certain regions of New Mexico to protect the Kuenzler's cactus and the Aplamado falcon, many near-coast OCS areas will require the same prohibition to protect avian and aquatic species or other resource, historic, cultural or public-use values. Development should also be prohibited in other areas of the OCS where it would prove incompatible with existing or projected marine uses (e.g., shipping lanes, ferry routes, offshore port development). Current or projected national marine transportation, marine safety and marine environmental protection needs should be determined by concerned federal agencies such as the USCG.

Further, given that many of the values protected under BLM's ROW rule are visual or aesthetic in nature, development just outside of a protected area may still degrade the protected area. MMS should prohibit development in more broadly defined areas, so as to ensure the protection of valuable resources, and should develop a visual resource management policy and guidance designed to minimize potential visual impacts of development. In addition, MMS should adopt, as BLM has with cultural resources, a policy of avoidance of an area where cultural, archeological or paleontological resources exist as the preferred mitigation option (this approach also

comports with OCSLA regulation dealing with archeological resources, 30 C.F.R. § 250.194).

The value of BLM's decision to conduct a programmatic review of wind energy development on public lands is evident in the environmental review context. With the benefit of a programmatic review, BLM is now in a position to expedite wind energy development by using a tiering process from individual site NEPA reviews. Site-specific NEPA analyses must still include analyses of project site configuration and micrositing considerations, monitoring program requirements and mitigation measures, but BLM is able to rely on the cumulative impacts discussed in the programmatic review and limit additional review to those cumulative impacts that are beyond the scope of the cumulative effects addressed in the programmatic review. Although BLM has allowed private development to proceed prior to completing the programmatic review, onshore wind energy development has been taking place on a small scale for years. In contrast, no development has occurred in the offshore environment, and MMS is in a position to ensure that *all* projects on the OCS are reviewed under a consistent framework, with the benefit of a programmatic review to guide *every* individual application.

More review will be necessary in the offshore environment than has been conducted onshore. The review of wildlife and other ecological resources recommended in the BLM ROW rule, for example, is not adequate for offshore wind energy development, both because so much less is understood about the role and use of offshore ecosystems than about terrestrial ecosystems and because it is much more difficult to track impacts on wildlife species in the marine environment.

An example of one area where additional information is required for offshore projects because of the lack of available information is impacts on bird and bat species. Specifically for these impacts, operators (and MMS in individual EISs) should be required at the very least to:

- Review existing information on species and habitat;
- Conduct surveys for federal and/or state-protected species and other species of concern;
- Identify important, sensitive or unique habitats;
- Evaluate bird and bat use of the project area;
- Evaluate potential for habitat fragmentation;

- Design the project to minimize or mitigate the potential for bird or bat strikes; and

- Develop a habitat restoration plan.

At the same time, more needs to be understood about the marine environment and the impacts of offshore wind energy, particularly on marine mammals, critical breeding grounds, and bird and bat species. A more rigorous review is required than has been prepared by BLM for land-based development. Similarly, proposed offshore development may require the preparation of a marine risk assessment for USCG review of marine transportation, safety and environmental impacts and their associated prevention and mitigation measures.

The measures BLM will implement to minimize impacts to visual resources, including historic sites and cultural resources, would not be as efficacious in the offshore environment. Turbine grids cannot be integrated with the surrounding landscape in the offshore environment. Impacts on visual resources in the offshore environment are likely to be far greater than on land, particularly because of the limited resource of near-coast OCS lands. Although the OCS is larger in size than the United States land mass, only a narrow band of OCS land visible from the coast exists. This band of OCS land is extraordinarily valuable, as evidenced by the high cost of coastal properties, the heavy concentration of population in coastal areas, the critical role in trade played by marine transportation, and the recreational and tourism-based demands on coastal areas. The unique value of this land to the public should be reflected in the MMS's siting parameters, with a goal of prohibiting development altogether in highly valued locations and encouraging development in already heavily industrialized environments and the far-shore environment.

III. Conclusion

The new MMS regulatory program for offshore renewable energy projects presents an excellent opportunity to develop a framework for promoting renewable power generation in an environmentally sound manner that could make the United States the world leader in this field. This can be done, as outlined in these comments, by following the sequential steps of: 1) imposing a moratorium on significant projects until a program is in place; 2) developing a national regulatory program; 3) conducting a programmatic site evaluation/environmental impact review on a regional basis; 4) eliminating areas of high resource conflict or environmental sensitivity from further review; and 5) proceeding with site selection and individual project review under stringent environmental standards.

Past experience demonstrates that, in the long-run, the five-point plan listed above is the most efficient and expeditious way to proceed. No doubt industry advocates and a few interest groups that seek to elevate renewable energy development over sound environmental and economic policy will argue for a "rush to development" scenario. As the experience with the CWA project to date confirms, that is exactly the wrong way to proceed and causes more problems than it cures. While the CWA project is an anomaly, it serves as a "lesson learned" on the need for a rational, well-planned approach to offshore development. If the basic approach outlined in these comments is followed, subject to specific regulations along the lines recommended by APNS herein, the United States will be in a position to establish a reasonable and highly efficient foundation upon which to develop properly-sited offshore renewable energy projects. The end result will be properly-sited projects and a well-planned, efficient national offshore renewable energy program that ensures protection for sensitive marine ecosystems like Nantucket Sound.

Maritime and Coastguard Agency

MARINE GUIDANCE NOTE

MGN 275 (M)

Proposed UK Offshore Renewable Energy Installations (OREI) - Guidance on Navigational Safety Issues.

Notice to Other UK Government Departments, Offshore Renewable Energy Developers, Port Authorities, Shipowners, Masters, Ships' Officers, Fishermen and Recreational Sailors.

Summary

This guidance note highlights issues that need to be taken into consideration when assessing the impact on navigational safety from offshore renewable energy developments, proposed for United Kingdom internal waters, territorial sea or in a Renewable Energy Zone, when established, beyond the territorial sea.

Key Points

- The recommendations in this guidance note should be used, primarily, by offshore renewable energy installation developers, seeking consent to undertake marine works.
- Specific annexes address issues covering; site position, structures and safety zones (Annex 1), developments, navigation, collision avoidance and communications (Annex 2), safety and mitigation measures recommended for OREI during construction, operation and decommissioning (Annex 3), search and rescue matters (Annex 4), Section 36 of the Electricity Act 1989, as amended by the Energy Act 2004 (Annex 5) and Article 60 of the United Nations Convention on the Law of the Sea (UNCLOS) (Annex 6).

Introduction:

1.1 Offshore Renewable Energy Installations (OREI) include offshore wind farms, marine current turbines, wave generators and any other installation, with the potential to affect marine navigation and safety, proposed for United Kingdom (UK) internal waters, territorial sea or in a Renewable Energy Zone (REZ), when established, beyond the territorial sea.

1.2 Recommendations in this guidance note should be taken into account by OREI developers seeking formal consent for marine works. Failure by developers to give due regard to these recommendations may result in objections to their proposals on the grounds of navigational safety. Additional information on the process for consenting offshore windfarms and the regulatory framework is available from the Offshore Renewables Consents Unit of Department for Trade and Industry (DTI)[1]. It should be noted, however, that DTI is not responsible for consenting projects in Northern Ireland internal and territorial waters.

[1] www.dti.gov.uk/energy/leg_and_reg/consents/guidance.pdf

1.3 The considerations and criteria contained in the attached annexes are intended to address the navigational impact of OREI proposed for UK sites. Their development necessitates the establishment of a clear consents process to deal with potential detrimental effects. The consent regime must take account of local factors, national standards and international aspects which could influence the establishment of an OREI. Under the regime, consents will not be granted if OREIs are likely to interfere with the use of recognised sea lanes essential to international navigation.

1.4 The Energy Act 2004 establishes a regulatory regime for OREI beyond territorial waters, in the UK's REZ, and supplements the regime which already applies in Great Britain's internal and territorial waters. Section 99 of the Act deals specifically with navigation and introduces a new section, 36B with the title "duties in relation to navigation" into section 36 of the Electricity Act 1989. The text of section 36, as amended by the Energy Act, is attached at Annex 5. Under 36B(1) a consent cannot be granted for an OREI which is likely to interfere with the use of recognised sea lanes essential to international navigation. This term is married at 36B(7) to Article 60(7) of the United Nations Convention on the Law of the Sea. The text of Article 60 is attached at Annex 6. 36B(2) consolidates into section 36 the provisions of section 34 of the Coast Protection Act 1949

1.5 The recommendations have been developed in consultation with DTI, the devolved government authorities for Scotland, Wales and Northern Ireland, mariners in the commercial, military, fisheries and recreational sectors, relevant associations and port authority representatives, the General Lighthouse Authorities (GLA) and emergency support services such as the Royal National Lifeboat Institution (RNLI).

2. How and when the recommendations should be used.

2.1 This Guidance Note, as the name implies, is intended for the guidance of developers and others. Whilst non mandatory, failure to heed the guidance may result in delaying the consents process. The recommendations should be taken into account by OREI developers and their contracted environmental and risk assessors in the preparation of Scoping Reports (SR), Environmental Impact Assessments (EIA) and resulting Environmental Statements (ES).

2.2 These should evaluate all navigational possibilities, which could be reasonably foreseeable, by which the siting, construction, establishment and de-commissioning of an OREI could cause or contribute to an obstruction of, or danger to, navigation or marine emergency services. They should also be used to assess the most favourable options to be adopted.

2.3 Potential navigational or communications difficulties caused to any mariners or emergency services using the site area and its environs should be assessed. Those difficulties which could contribute to a marine casualty leading to injury, death or loss of property, either at sea or amongst the population ashore, should be highlighted as well as those affecting emergency services. Consultation with local and national search and rescue authorities should be initiated and consideration given to the types of vessels and equipment which might be used in emergencies. This should include the possible use of OREI structures as emergency refuges.

2.4 Assessments should be made of the consequences of ships deviating from normal routes or recreational craft entering shipping routes in order to avoid proposed sites. Special regard should be given to evaluating situations which could lead to safety of navigation being compromised e.g. an increase in 'end-on' or 'crossing' encounters, reduction in sea-room or water depth for manoeuvring etc.

2.5 *In terms of navigational priority, these recommendations do not encourage a differentiation to be made between any types of seagoing water craft, operations, or mariners.*

3. Annexes:

3.1 The recommendations contained therein apply to all sites, whether within the jurisdiction of port limits or in open sea areas. However, port authorities may require developers to comply with their own specific criteria. In addition, where proposals within port limits could affect navigation or emergency planning, the port authorities will be under an obligation to review its safety management system, in accordance with the Port Marine Safety Code. Such reviews should be undertaken in parallel with the OREI developer's Environmental Impact Assessment and the outcome addressed in the resulting Environmental Statement.

3.2 OREI developers should comply with the recommendations during all phases of their planning, construction, operation and decommissioning.

3.3 Information concerning their navigational impact during these four phases should be promulgated in ample time to all relevant mariners, organisations and authorities.

3.4 Contingency arrangements to deal with marine casualties in, or adjacent to sites, including responses to environmental pollution, should be planned, and practised to test their efficiency.

3.5 The following annexes contain recommendations on:

Annex 1: Considerations on site position and structure.

Annex 2: Navigation, collision avoidance and communications.

Annex 3: Safety and mitigation measures recommended for OREI during construction, operation and decommissioning.

Annex 4: Standards and procedures for wind turbine generator shutdown in the event of a search and rescue, counter pollution or salvage incident in or around a wind farm.

3.6 The following annexes contain regulatory extracts:

Annex 5: Section 36 of the Electricity Act 1989 (as amended by the Energy Act 2004).

Annex 6: Article 60 of the United Nations Convention on the Law of the Sea (UNCLOS), relating to artificial islands, installations and structures in the exclusive economic zone.

3.7 **Note:** *The Maritime and Coastguard Agency (MCA) reserves the right to vary or modify these recommendations on the basis of experience or in accordance with internationally recognised standards in the interest of safety of life at sea and protection of the marine environment. As other types of offshore renewable energy installations are developed, new annexes to this document will be introduced and a revision of this Marine Guidance Note will be issued.*

Hydrography, Meteorology & Ports Branch
Bay 2/30 Spring Place
Maritime and Coastguard Agency
105 Commercial Road
Southampton SO15 1EG

Tel: 02380 329135
Fax: 02380 329204

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Annex 1

Considerations on Site Position, Structures and Safety Zones

1. Traffic Survey

An up to date[2] traffic survey of the area concerned should be undertaken. This should include all vessel types and is likely to total at least four weeks duration but also taking account of seasonal variations in traffic patterns. These variations should be determined in consultation with representative recreational and fishing vessel organisations, and, where appropriate, port and navigation authorities. Whilst recognising that site-specific factors need to be taken into consideration, any such survey should, in general, assess:

a. Proposed OREI site relative to areas used by any type of marine craft.

b. Numbers, types and sizes of vessels presently using such areas.

c. Non-transit uses of the areas, e.g. fishing, day cruising of leisure craft, racing, aggregate dredging, etc.

d. Whether these areas contain transit routes used by coastal or deep-draught vessels on passage.

e. Alignment and proximity of the site relative to adjacent shipping lanes.

f. Whether the nearby area contains prescribed routeing schemes or precautionary areas.

g. Whether the site lies on or near a prescribed or conventionally accepted separation zone between two opposing routes.

h. Proximity of the site to areas used for anchorage, safe haven, port approaches and pilot boarding or landing areas.

i. Whether the site lies within the limits of jurisdiction of a port and/or navigation authority.

j. Proximity of the site to existing fishing grounds, or to routes used by fishing vessels to such grounds.

k. Proximity of the site to offshore firing/bombing ranges and areas used for any marine military purposes.

l. Proximity of the site to existing or proposed offshore oil / gas platform, marine aggregate dredging, marine archaeological sites or wrecks, or other exploration/exploitation sites.

m. Proximity of the site relative to any designated areas for the disposal of dredging spoil.

n. Proximity of the site to aids to navigation and/or Vessel Traffic Services (VTS) in or adjacent to the area and any impact thereon.

o. Researched opinion using computer simulation techniques with respect to the displacement of traffic and, in particular, the creation of 'choke points' in areas of high traffic density.

[2] Within 12 months prior to the submission of the Environmental Statement

2. OREI Structures

It should be determined:

a. Whether any features of the OREI, including auxiliary platforms outside the main generator site and cabling to the shore, could pose any type of difficulty or danger to vessels underway, performing normal operations, or anchoring.

   Such dangers would include clearances of wind turbine blades above the sea surface, the least depth of current turbine blades, the burial depth of cabling, etc.

Note: Recommended minimum safe (air) clearances between sea level conditions at mean high water springs (MHWS) and wind turbine rotors are that they should be suitable for the vessels types identified in the traffic survey but generally not less than 22 metres. Depths, clearances and similar features of other OREI types which might affect marine safety should be determined on a case by case basis.

b. Whether any feature of the installation could create problems for emergency rescue services, including the use of lifeboats, helicopters and emergency towing vessels (ETVs)

c. How rotor blade rotation and power transmission, etc., will be controlled by the designated services when this is required in an emergency.

Note: Annex 4 of this document details HM Coastguard recommended standards and procedures for the use of an Active Safety Management System (ASMS) in the event of an incident in or around an offshore wind farm.

3. Assessment of Access to and Navigation Within, or Close to , an OREI

To determine the extent to which navigation would be feasible within the OREI site itself by assessing whether:

a. Navigation within the site would be safe :

i. by all vessels, or
ii. by specified vessel types, operations and/or sizes.
iii. in all directions or areas, or
iv. in specified directions or areas.
v. in specified tidal, weather or other conditions.

b. Navigation in and/or near the site should be :

i. prohibited by specified vessels types, operations and/or sizes.
ii. ii. prohibited in respect of specific activities,
iii. prohibited in all areas or directions, or
iv. prohibited in specified areas or directions, or
v. prohibited in specified tidal or weather conditions, or simply
vi. recommended to be avoided.

c. Exclusion from the site could cause navigational, safety or routeing problems for vessels operating in the area.

Note : Relevant information concerning a decision to seek a "safety zone" for a particular site during any point in its construction, operation or decommissioning, should be promulgated to MCA and other interested parties without delay.

Annex 2

Navigation, collision avoidance and communications

1. The Effect of Tides and Tidal Streams :

It should be determined whether or not:

i. Current maritime traffic flows and operations in the general area are affected by the depth of water in which the proposed installation is situated at various states of the tide i.e. whether the installation could pose problems at high water which do not exist at low water conditions, and vice versa.

ii. Set and rate of the tidal stream, at any state of the tide, has a significant affect on vessels in the area of the OREI site.

iii. Maximum rate tidal stream runs parallel to the major axis of the proposed site layout, and, if so, its effect.

iv. The set is across the major axis of the layout at any time, and, if so, at what rate.

v. In general, whether engine failure or other circumstance could cause vessels to be set into danger by the tidal stream.

vi. Structures themselves could cause changes in the set and rate of the tidal stream.

vii. Structures in the tidal stream could be such as to produce siltation, deposition of sediment or scouring, affecting navigable water depths in the windfarm area or adjacent to the area.

Note: In relation to Sub Paragraph vii above, it is considered necessary that a hydrographic survey of the site and its immediate environs be undertaken to establish a baseline. Such a survey should be undertaken to at least International Hydrographic Organization (IHO) Order 1 standard multibeam bathymetry , with final data being supplied as a digital full density data set, and erroneous soundings flagged as deleted but included in the data set.

2. Weather:

To determine if:

i. The site, in normal, bad weather, or restricted visibility conditions, could present difficulties or dangers to craft, including sailing vessels, which might pass in close proximity to it.

ii. The structures could create problems in the area for vessels under sail, such as wind masking, turbulence or sheer.

3. Visual Navigation and Collision Avoidance:

To assess the extent to which:

i. Structures could block or hinder the view of other vessels under way on any route.

ii. Structures could block or hinder the view of the coastline or of any other navigational feature such as aids to navigation, landmarks, promontories, etc.

4. Communications, Radar and Positioning Systems :

To provide researched opinion of a generic and, where appropriate, site specific nature concerning whether or not:

i. Structures could produce radio interference such as shadowing, reflections or phase changes, with respect to any frequencies used for marine positioning, navigation or communications, including Automatic Identification Systems (AIS), whether ship borne, ashore or fitted to any of the proposed structures.

ii. Structures could produce radar reflections, blind spots, shadow areas or other adverse effects:

   a. Vessel to vessel;
   b. Vessel to shore;
   c. VTS radar to vessel;
   d. Racon to/from vessel.

iii. OREI, in general, would comply with current recommendations concerning electromagnetic interference.

iv. Structures and generators might produce sonar interference affecting fishing, industrial or military systems used in the area.

v. Site might produce acoustic noise which could mask prescribed sound signals.

vi. Generators and the seabed cabling within the site and onshore might produce electro-magnetic fields affecting compasses and other navigation systems.

5. Marine Navigational Marking :

To determine:

i. How the overall site would be marked by day and by night taking into account that there may be an ongoing requirement for marking on completion of decommissioning, depending on individual circumstances.

ii. How individual structures on the perimeter of and within the site, both above and below the sea surface, would be marked by day and by night.

iii. If the site would be marked by one or more racons and/ or,

iv. If the site would be marked by an Automatic Identification System (AIS) transceiver, and if so, the data it would transmit.

v. If the site would be fitted with a sound signal, and where the signal or signals would be sited.

vi. Whether the proposed site and/or its individual generators would comply in general with markings for such structures, as required by the relevant General Lighthouse Authority (GLA) or recommended by the Maritime and Coastguard Agency, respectively.

vii. The aids to navigation specified by the GLAs are being maintained such that the 'availability criteria', as laid down and applied by the GLAs, is met at all times. Separate detailed guidance is available from the GLAs on this matter.

viii. The procedures that need to be put in place to respond to casualties to the aids to navigation specified by the GLAs, within the timescales laid down and specified by the GLAs.

Annex 3

Safety and mitigation measures recommended for OREI during construction, operation and decommissioning.

3.1 Mitigation and safety measures will be applied to the OREI development appropriate to the level and type of risk determined during the Environmental Impact Assessment (EIA).The specific measures to be employed will be selected in consultation with the Maritime and Coastguard Agency and will be listed in the developer's Environmental Statement (ES). These will be consistent with international standards contained in, for example, the Safety of Life at Sea (SOLAS) Convention - Chapter V, IMO Resolution A.572 (14)[3] and Resolution A.671(16)[4] and could include any or all of the following:

i. Promulgation of information and warnings through notices to mariners and other appropriate media.

ii. Continuous watch by multi-channel VHF, including Digital Selective Calling (DSC).

iii. Safety zones of appropriate configuration, extent and application to specified vessels.

iv. Designation of the site as an area to be avoided (ATBA).

v. Implementation of routeing measures within or near to the development.

vi. Monitoring by radar, AIS and/or closed circuit television (CCTV).

vii. Appropriate means to notify and provide evidence of the infringement of safety zones or ATBA's.

viii. Any other measures and procedures considered appropriate in consultation with other stakeholders.

[3] "General Provisions on Ships' Routeing", adopted on 20 November 1985

[4] "Safety Zones and Safety of Navigation around Offshore Installations and Structures", adopted 19 October 1989.

Annex 4

Standards and procedures for wind turbine generator shutdown in the event of a search and rescue, counter pollution or salvage incident in or around a wind farm.

1. Design Requirements

The wind farm should be designed and constructed to satisfy the following design requirements for emergency rotor shut-down in the event of a search and rescue (SAR), counter pollution or salvage operation in or around a wind farm:

i. All wind turbine generators (WTGs) will be marked with clearly visible unique identification characters. The identification characters shall each be illuminated by a low-intensity light visible from a vessel thus enabling the structure to be detected at a suitable distance to avoid a collision with it. The size of the identification characters in combination with the lighting should be such that, under normal conditions of visibility and all known tidal conditions, they are clearly readable by an observer, stationed 3 metres above sea levels, and at a distance of at least 150 metres from the turbine. It is recommended that lighting for this purpose be hooded or baffled so as to avoid unnecessary light pollution or confusion with navigation marks. (Precise dimensions to be determined by the height of lights and necessary range of visibility of the identification numbers).

ii. All WTGs should be equipped with control mechanisms that can be operated from the Central Control Room of the wind farm.

iii. Throughout the design process for a wind farm, appropriate assessments and methods for safe shutdown should be established and agreed, through consultation with MCA and other emergency support services.

iv. The WTG control mechanisms should allow the Control Room Operator to fix and maintain the position of the WTG blades as determined by the Maritime Rescue Co-ordination Centre or Maritime Rescue Sub Centre (MRCC/SC).

v. Nacelle hatches should be capable of being opened from the outside. This will allow rescuers (e.g. helicopter winch-man) to gain access to the tower if tower occupants are unable to assist and when sea-borne approach is not possible.

vi. Access ladders, although designed for entry by trained personnel using specialised equipment and procedures for turbine maintenance in calm weather, could conceivably be used, in an emergency situation, to provide refuge on the turbine structure for distressed mariners. This scenario should therefore be considered when identifying the optimum position of such ladders and take into account the prevailing wind, wave and tidal conditions.

2. Operational Requirements

i. The Central Control Room should be manned 24 hours a day.

ii. The Central Control Room operator should have a chart indicating the Global Positioning System (GPS) position and unique identification numbers of each of the WTGs in the wind farm.

iii. All MRCC/SCs will be advised of the contact telephone number of the Central Control Room.

iv. All MRCC/SCs will have a chart indicating the GPS position and unique identification number of each of the WTGs in all wind farms.

3. Operational Procedures

i. Upon receiving a distress call or other emergency alert from a vessel which is concerned about a possible collision with a WTG or is already close to or within the wind farm, the MRCC/SC will establish the position of the vessel and the identification numbers of any WTGs which are visible to the vessel. The position of the vessel and identification numbers of the WTGs will be passed immediately to the Central Control Room by the MRCC/SC.

ii. The control room operator should immediately initiate the shut-down procedure for those WTGs as requested by the MRCC/SC, and maintain the WTG in the appropriate shut-down position, again as requested by the MRCC/SC, until receiving notification from the MRCC/SC that it is safe to restart the WTG.

iii. Communication and shutdown procedures should be tested satisfactorily at least twice a year

Note: Other types, designs and configurations of OREI will be similarly evaluated and procedures laid down by the Maritime and Coastguard Agency, in consultation with appropriate stakeholders, during the Scoping and Environmental Impact Assessment processes.

Annex 5

Section 36 of the Electricity Act 1989 (as amended by the Energy Act 2004)

36 Consent required for construction etc of generating stations

(1) Subject to subsections (2) and (4) below, a generating station shall not be constructed at a relevant place (within the meaning of section 4), and a generating station at such a place shall not be extended or operated except in accordance with a consent granted by the Secretary of State.

(2) Subsection (1) above shall not apply to a generating station whose capacity –

(a) does not exceed the permitted capacity, that is to say, 50 megawatts; and

(b) in the case of a generating station which is to be constructed or extended, will not exceed the permitted capacity when it is constructed or extended;
and an order under this subsection may make different provision for generating stations of different classes or descriptions.

(3) The Secretary of State may by order provide that subsection (2) above shall have effect as if for the permitted capacity mentioned in paragraph (a) there were substituted such other capacity as may be specified in the order.

(4) The Secretary of State may by order direct that subsection (1) above shall not apply to generating stations of a particular class or description, either generally or for such purposes as may be specified in the order.

(5) A consent under this subsection –

(a) may include such conditions (including conditions as to the ownership or operation of the station) as appear to the Secretary of State to be appropriate; and

(b) shall continue in force for such a period as may be specified in or determined by or under the consent.

(6) Any person who without reasonable excuse contravenes the provisions of this section shall be liable on summary conviction to a fine not exceeding level 5 on the standard scale.

(7) No proceedings shall be instituted in England and Wales in respect of an offence under this section except by or on behalf of the Secretary of State.

(8) The provisions of Schedule 8 of the Act (which relates to consents under this section and section 37 below) shall have effect.

(9) In this Part "extension", in relation to a generating station, includes the use by the person operating the station of any land (wherever situated) for a purpose directly related to the generation of electricity by that station and "extend" shall be construed accordingly.

36A Declarations extinguishing etc. public rights of navigation

(1) Where a consent is granted by the Secretary of State or the Scottish Ministers in relation to –

(a) the construction or operation of a generating station that comprises or is to comprise (in whole or in part) renewable energy installations situated at places in relevant waters, or

(b) an extension that is to comprise (in whole or in part) renewable energy installations situated at places in relevant waters or an extension of such an installation,

he or (as the case may be) they may, at the same time, make a declaration under this section as respects rights of navigation so far as they pass through some or all of those places.

(2) The Secretary of State or the Scottish Ministers may make a declaration only if the applicant for the consent made an application for such a declaration when making his application for the consent.

(3) A declaration under this section is one declaring that the rights of navigation specified or described in it -

(a) are extinguished;

(b) are suspended for a period that is specified in the declaration;

(c) are suspended until such time as may be determined in accordance with provision contained in the declaration; or

(d) are to be exercisable subject to such restrictions or conditions, or both, as are set out in the declaration.

(4) A declaration under this section –

(a) has effect, in relation to the rights specified or described in it, from the time at which it comes into force; and

(b) continues in force for such a period as may be specified in the declaration or as may be determined in accordance with provision contained in it.

(5) A declaration under this section –

(a) must identify the renewable energy installations, or proposed renewable energy installations, by reference to which it is made;

(b) must specify the date on which it is to come into force, or the means by which that date is to be determined;

(c) may modify or revoke a previous such declaration, or a declaration under section 101 of the Energy Act 2004; and

(d) may make different provision in relation to different means of exercising a right of navigation.

(6) Where a declaration is made under this section by the Secretary of State or the Scottish Ministers, or a determination is made by him or them for the purposes of a provision contained in such a declaration, he or (as the case may be) they must either -

(a) publish the declaration or determination in such a manner as appears to him or them to be appropriate for bringing it, as soon as is reasonably practicable, to the attention of persons likely to be affected by it; or

(b) secure that it is published in that manner by the applicant for the declaration.

(7) In this section –

"consent" means a consent under section 36 above;

"extension", in relation to a renewable energy installation, has the same meaning as in Chapter 2 of Part 3 of the Energy Act 2004

"relevant waters" means waters in or adjacent to Great Britain which are between the mean low water mark and the seaward limits of the territorial sea.

36B Duties in relation to navigation

(1) Neither the Secretary of State nor the Scottish Ministers may grant a consent in relation to any particular offshore generating activities if he considers, or (as the case may be) they consider, that interference with the use of recognised sea lanes essential to international navigation:

(a) is likely to be caused by the carrying on of those activities; or

(b) is likely to result from their having been carried on.

(2) It shall be the duty both of the Secretary of State and of the Scottish Ministers, in determining:

(a) whether to give a consent for any particular offshore generating activities, and

(b) what conditions to include in such a consent,
to have regard to the extent and nature of any obstruction of or danger to navigation which (without amounting to interference with the use of such sea lanes) is likely to be caused by the carrying on of the activities, or is likely to result from their having been carried on.

(3) In determining for the purposes of this section what interference, obstruction or danger is likely and its extent and nature, the Secretary of State or (as the case may be) the Scottish Ministers must have regard to the likely effect (both while being carried on and subsequently) of -

(a) the activities in question; and

(b) such other offshore generating activities as are either already the subject of consents or are activities in respect of which it appears likely that consents will be granted.

(4) For the purposes of this section the effects of offshore generating activities include:

(a) how, in relation to those activities, the Secretary of State and the Scottish Ministers have exercised or will exercise their powers under section 36A above and section 101 of the Energy Act 2004 (extinguishment of public rights of navigation); and

(b) how, in relation to those activities, the Secretary of State has exercised or will exercise his powers under sections 94 and 95 and Chapter 3 of Part 2 of that Act (safety zones and decommissioning).

(5) If the person who has granted a consent in relation to any offshore generating activities thinks it appropriate to do so in the interests of the safety of navigation, he may at any time vary conditions of the consent so as to modify in relation to any of the following matters the obligations imposed by those conditions –

(a) the provision of aids to navigation (including, in particular, lights and signals);

(b) the stationing of guard ships in the vicinity of the place where the activities are being or are to be carried on; or

(c) the taking of other measures for the purposes of, or in connection with, the control of the movement of vessels in that vicinity.

(6) A modification in exercise of the power under subsection (5) must be set out in a notice given by the person who granted the consent to the person whose obligations are modified.

(7) In this section –

'consent' means a consent under section 36 above;

'offshore generating activities' means –

(a) the construction or operation of a generating station that is to comprise or comprises (in whole or in part) renewable energy installations; or

(b) an extension of a generating station that is to comprise (in whole or in part) renewable energy installations or an extension of such an installations;

'the use of recognised sea lanes essential to international navigation' means –

(a) anything that constitutes the use of such a sea lane for the purposes of Article 60 (7) of the United Nations Convention on the Law of the Sea 1082 (Cmnd 8941); or

(b) any use of waters in the territorial sea adjacent to Great Britain that would fall within paragraph (a) if the waters were in a Renewable Energy Zone.

(8) In subsection (7) 'extension', in relation to a renewable energy installation, has the same meaning as in Chapter 2 of Part 2 of the Energy Act 2004.

Article 60 UNCLOS - Artificial islands, installations and structures in the exclusive economic zone

1. In the exclusive economic zone, the coastal State shall have the exclusive right to construct and to authorize and regulate the construction, operation and use of:

   a. artificial islands;

   b. installations and structures for the purposes provided for in article 56 and other economic purposes;

   c. installations and structures which may interfere with the exercise of the rights of the coastal State in the zone.

2. The coastal State shall have exclusive jurisdiction over such artificial islands installations and structures, including jurisdiction with regard to customs fiscal health, safety and immigration laws and regulations.

3. Due notice must be given of the construction of such artificial islands, installations or structures, and permanent means for giving warning of their presence must be maintained. Any installations or structures which are abandoned or disused shall be removed to ensure safety of navigation, taking into account any generally accepted international standards established in this regard by the competent international organization. Such removal shall also have due regard to fishing, the protection of the marine environment and the rights and duties of other States. Appropriate publicity shall be given to the depth, position and dimensions of any installations or structures not entirely removed.

4. The coastal State may, where necessary, establish reasonable safety zones around such artificial islands, installations and structures in which it may take appropriate measures to ensure the safety both of navigation and of the artificial islands, installations and structures.

5. The breadth of the safety zones shall be determined by the coastal State taking into account applicable international standards. Such zones shall be designed to ensure that they are reasonably related to the nature and function of the artificial islands, installations or structures, and shall not exceed a distance of 500 metres around them, measured from each point of their outer edge, except as authorized by generally accepted international standards or as recommended by the competent international organization. Due notice shall be given of the extent of safety zones.

6. All ships must respect these safety zones and shall comply with generally accepted international standards regarding navigation in the vicinity of artificial islands, installations, structures and safety zones.

7. Artificial islands, installations and structures and the safety zones around them may not be established where interference may be caused to the use of recognized sea lanes essential to international navigation.

8. Artificial islands, installations and structures do not possess the status of islands. They have no territorial sea of their own, and their presence does not affect the delimitation of the territorial sea, the exclusive economic zone or the continental shelf.

EXHIBIT 2

Review of the Cape Wind Project Cannot Proceed Separately

As an initial matter, there is nothing in section 388 that justifies considering the CWA project before an underlying program is in place.

Questions have been raised regarding the effect of the "savings provision" in section 388(d) on the CWA project. Although the savings provision is notable for its ambiguous phrasing, the best interpretation of the provision is that it simply prevents CWA from: 1) needing authorization from MMS for the pre-existing data tower; and 2) needing to resubmit its application for a section 10 permit under the Rivers and Harbors Act of 1899 for the entire proposed project. Section 388(d) does not exempt Cape Wind from undergoing the permitting process for which the Secretary is directed to issue regulations "not later than 270 days after the enactment" of the Act. Nor does it provide any justification or rationale for the harmful, arbitrary and capricious action of proceeding with review of this project before a full regulatory program is in place.

The savings provision, which is found in section 388(d), states:

> Nothing in the amendment made by subsection (a) requires the resubmittal of any document that was previously submitted or the reauthorization of any action that was previously authorized with respect to any project for which, before the date of the enactment of this Act-
>
> (1) an offshore test facility has been constructed; or
>
> (2) a request for a proposal has been issued by a public authority.

This provision does not exempt CWA from the review process to be established under section 388. First, to exempt individual projects from a review process that all other projects must undergo would likely require a more direct and explicit statement of intent before the Secretary would so interpret the provision. In addition, the structure of subsection (a), which is the source of the Secretary's authorization, supports a contrary conclusion. Subsection (a) specifically exempts CWA from the Secretary's mandatory duty to evaluate whether competitive bidding is appropriate. Although the scope of this exemption is problematic, as discussed in more detail below, a specific exemption from one part of subsection (a) is necessary only if the project is not exempt from the other parts of the section. Thus, the exemption from mandatory evaluation for competitive bidding supports the argument that CWA must meet all the other requirements set forth in section 388, including

whatever process is created to implement the payments, requirements, lease duration, security and consultation provisions of subsection (a).

In addition, the introductory clause focuses on two actions: 1) the "submittal" of previously filed documents; and 2) the approval of previously "authorized" actions. It provides that previously submitted documents need not be resubmitted and previously approved actions need not be reauthorized. With regard to CWA, no documents had been "submitted" to MMS for approval of use of the OCS at the time of enactment of section 388; nor have any authorizations been issued for that purpose. The CWA draft EIS itself also has not been "submitted." It is a Corps document released for public review. The only "grandfathered" actions therefore are the section 10 application "submitted" in 2001 and the previously approved data tower.

Finally, in practical terms, MMS lacks any basis to find that section 388 exempts CWA from the OCS authorization or the environmental review processes. In fact, MMS was quite critical of the CWA draft EIS. DOI stated that it would have been more appropriate for the Corps to have directed CWA to conduct a three-year, year-round biological assessment of bird and bat species, and that further analyses of impacts on avian species are necessary. In addition, MMS noted, among other things, that the DEIS failed to include necessary information regarding the lubricants and oils to be used in the project, and vessel discharges associated with maintenance. Indeed, DOI called for the issuance of a supplemental EIS. Given DOI's reservations regarding the draft EIS, it is unlikely that MMS can, or should interpret section 388 in a manner that would exempt CWA from meeting environmental review obligations.

The same reasoning applies to CWA's effort to escape competitive bidding. Subsection (a)(3) provides:

> Except with respect to projects that meet the criteria established under section 388(d) of the Energy Policy Act of 2005, the Secretary shall issue a lease, easement, or right-of-way under paragraph (1) on a competitive basis unless the Secretary determines after public notice of a proposed lease, easement, or right-of-way that there is no competitive interest.

To paraphrase subsection (a)(3); Except with respect to CWA, the Secretary shall issue a lease, easement, or right-of-way on a competitive basis unless the Secretary determines that there is no competitive interest.

It has been suggested that this provision exempts CWA from the competitive bidding process. It does not. Indeed, it could be read as requiring the Secretary to issue a lease for CWA *only* on a competitive basis. Thus, for any other project, the Secretary can issue a lease on a non-competitive basis after determining that there is no competitive interest. For these two projects, however, there is no express

provision that allows CWA to be considered by the Secretary for non-competitive bidding.

Alternatively, because subsection (a)(3) does not prohibit the Secretary from issuing a lease on a competitive basis, the Secretary could determine that a competitive bidding process is nonetheless appropriate and require one for CWA. Under this evaluation, any Nantucket Sound site considered available for renewable energy development should be subjected to competitive bidding. In addition, bidding should be open to any party, not just energy developers.

For all of these reasons, there is no basis to proceed with the review of CWA in any fashion until a national regulatory program is in place *and* the regional programmatic review has been conducted. CWA seeks to build the first offshore wind energy project in the United States and largest in the world in a prized marine ecosystem. It is unjustified to consider a project of this magnitude with its attendant conflicts and adverse impacts before an underlying regulatory program is in place and broad-scale site selection has occurred.

In terms of rational decision-making and efficient allocation of federal resources, it is clear that a location like Nantucket Sound would <u>never</u> be selected for such a project under the format described above. Simply put, Nantucket Sound is one of the most conflicted possible locations on the east coast of the United States for a large-scale offshore energy project, and the adverse impacts far exceed the benefits, especially when the number of alternative sites throughout the Northeast/mid-Atlantic region is considered. Under both the UK and BLM program, sites such as Nantucket Sound would be classified as inappropriate for development, and there clearly is no justification for allowing the CWA project to proceed at all, let alone in advance of the implementation of an offshore renewable energy program.

Free But Costly:
An Economic Analysis of a Wind Farm in Nantucket Sound

Douglas Giuffre
Jonathan Haughton
David G. Tuerck

Beacon Hill Institute at Suffolk University
8 Ashburton Place, Boston, MA 02108
Web: www.beaconhill.org phone: 617-573-8750 fax: 617-720-4272 email: bhi@beaconhill.org
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Executive Summary

Cape Wind Associates proposes to build the world's largest offshore wind farm, with 130 tall turbines, on a 24 square mile area of Horseshoe Shoals in Nantucket Sound. The project is controversial. Cape Wind argues that the project will lower electricity costs to consumers, reduce emissions from power plants in the New England region, contribute to greater energy diversity and independence and create more jobs on Cape Cod. Critics of the project are concerned about the high cost of offshore wind-generated electricity and warn against the environmental impacts and aesthetic effects of 130 windmills, which they fear will deter tourists and depress land values.

In October 2003, the Beacon Hill Institute published *Blowing in the Wind: Offshore Wind and the Cape Cod Economy*. In that study, authors Jonathan Haughton, Douglas Giuffre and John Barrett reported and interpreted the responses of a thousand tourists and home owners whom DAPA Research had surveyed over the course of the preceding summer. The purpose of that study was to assess the principal effects of the wind farm on the Cape Cod economy. The findings were:

- There would be a small decline in tourism, causing the loss of 1,173 to 2,533 jobs.
- According to homeowners, property values would fall by 4.6% or by $1.35 billion.
- According to an overwhelming majority of tourists and homeowners, the wind farm should be required to pay a royalty to operate on Horseshoe Shoal. On the average, homeowners suggested a royalty of 8.06% and tourists a royalty of 7.66% of sales.

While these effects on the Cape Cod economy are important, they do not account for the full array of economic costs and benefits that the wind farm would impose or confer on the greater society. One of the principal benefits of wind power, much emphasized by its advocates, is the reduction in fossil fuel consumption and the attendant environmental benefits and improved energy independence. The wind farm is undergoing a review process, the outcome of which will depend in part on the assessment of these and other benefits.

It is not enough to rely on piecemeal claims about costs and benefits in deciding an issue as vast and complex as that posed by this project. The developer has chosen to place an installation remarkable for its size in a location remarkable for its pristine character. In doing so, Cape Wind has challenged the regulatory authorities and the greater community to provide a comprehensive framework within which it is possible to assess at least the most important of the economic costs and benefits in a systematic, objective fashion.

This report aims to provide the framework required for this task. There is the danger that, because the wind is "free" and fossil fuel is not, the project will proceed without adequate consideration of the very real costs that it would impose. This would be as short sighted as an automatic rejection of the project because it would not pass muster financially without subsidization by government.

Our report quantifies the economic costs that the project would impose and the economic benefits that it would confer. The costs include those of installing and operating the physical plant and of integrating it into the New England power grid. They include, as well, such "external costs" as the project might impose, costs that we classify under the rubric of environmental effects – generally, the negative aesthetic effects on the view of Nantucket Sound that the project would have plus negative effects on birds and marine life. The benefits include the reduction in fossil fuel burned, the reduced emissions and the greater energy independence.

Once the sum of the benefits and the sum of the costs are calculated, we subtract the second from the first to obtain a measure of the net benefits to society. This measure provides a bottom-line assessment of whether, from the point of view of the greater society, the project should go forward, or not. It is akin to the up-or-down verdict of a jury on which every stakeholder has a place.

For the proposed wind farm, the jury is in. The economic costs of the project, in present value terms, come to $947.2 million. The economic benefits come to $735.5 million. The costs exceed the benefits by $211.8 million (the difference owed to rounding). Based on these numbers, it does not make sense, from a societal point of view, to build the project. The wind may be free, but wind power from Nantucket Sound is costly.

Yet Cape Wind is eager to see the project built. This is because of the difference between (1) the economic costs and benefits of the project to society as a whole and (2) the narrower financial costs and benefits to Cape Wind. We show that the project would indeed make a positive (if modest) profit for the developer even as it imposes a net economic loss.

Despite being economically undesirable, the project would be privately profitable because of the very large subsidies that it would receive. The most important subsidy would stem from the "green credits" that result from recent changes to the law in Massachusetts: Electricity consumers in the Commonwealth are required to buy a growing proportion of their electricity from new renewable sources, requiring them,

in practice, to pay a premium for their power. This premium will raise the price received by Cape Wind, normally 4.7 cents per kilowatt hour (kWh), by about 2.5 cents/kWh and amounts to a total subsidy (in present value terms) of $157 million from Massachusetts ratepayers.

A Federal Renewable Electricity Production Credit (REPC), which expired in 2003 but is expected to be reinstated later this year, is likely to raise the "levelized" (revenue per kWh, in present value terms) revenue by a further 0.8 cents/kWh and represents a total subsidy of $84 million.

Wind energy is clean, and so it is appropriate to subsidize its production relative to power plants that use fossil fuels. But because the Cape Wind project would inflict net economic losses on society as a whole, it follows that the subsidy it would receive must be larger than socially desirable.

Cape Wind would receive a subsidy of 3.3 cents/kWh. We estimate that the appropriate subsidy would be 2.24 cents/kWh. The difference, 1.06 cents/kWh, is the amount by which society will overpay for electricity produced by the wind farm if the project goes on line. This is equivalent to an excess subsidy of $74 million.

It is worth noting, in addition, that even had the wind farm turned out beneficial to the greater society, its practical value to the immediate community it is intended to serve would be small. This is in part because of the small amount of generating capacity that it would add to that already in existence and in part because the fact that any saving in electricity prices would be short lived.

At its maximum, the portion of existing electricity represented by wind farm production would be 0.94% for New England and 2.51% for Massachusetts. And, while there would be some immediate saving to ratepayers, that saving would be captured mainly by commercial and industrial users and would dissipate in no more than a year. Moreover, the effects on the Cape economy would, as our earlier study showed, almost certainly be negative. The jobs that the installation and operation of the facility would bring about would be more than offset by the job reduction due to decreased tourism; the net effect is that the Cape would lose at least 1,000 jobs.

Another question is, "Why this project?" The project would not be a significant moneymaker for the developer. We find that the project would yield a respectable but modest 12.2% rate of return on equity. The rate of return could be as high as 18.1% but as low as 6.6%. The project would be expected to yield a profit (in present value terms) of $41.7 million. But there is no guarantee that it will make a profit of this

size or, for that matter, break even. Unforeseen increases in construction or maintenance costs and the unpredictability of wind speeds add an element of risk to this enterprise.

There is a 12% chance that the wind farm would lose at least $50 million. This raises the question of what happens to the wind turbines should financial considerations lead the developer to shut down the project. It also strengthens the case for contingency plans aimed at dismantling the turbines in the event that they are ultimately taken off line.

That its developers would incur the risks posed by this project is curious in light of the relatively better odds for success in building a land-based facility. Wind farms in West Texas appear to operate at half the cost of the proposed Horseshoe Shoal wind farm.

An appropriately-placed land-based facility in an area with wind conditions comparable to, or even significantly less than, those on Horseshoe Shoal would be substantially less costly for the greater society than the Cape Wind project.

One might think that the unique and pristine character of Nantucket Sound would figure strongly into our determination that the social costs of the Cape Wind project would outweigh the social benefits. But that is not so. Even if we ignore the aesthetic and environmental costs of producing wind power at this particular site, the economic costs exceed the economic benefits. Our study stands as warning, therefore, against offshore wind power anywhere along the U.S. coastline, not just at this site. Cape Wind may prevail in its efforts to build in Nantucket, but it will be despite, rather, than because of any benefits to the greater society. And, oddly, Cape Wind itself might end up not benefiting as much as it expects.

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1. Introduction

In November 2001, a private developer, Cape Wind Associates, filed an application with the U.S. Army Corps of Engineers for permission to construct the nation's first offshore wind farm in Nantucket Sound. The project would consist of 130 wind turbines, the world's biggest, each approximately 420 feet tall, arrayed over a 24 square mile area of the Sound known as Horseshoe Shoals. The wind farm would be sited five miles off the coast, in federal Outer Continental Shelf (OCS) waters. From there, undersea cables would transmit power through state waters to an onshore distribution grid. The project, according to Cape Wind, would have an installed nameplate capacity of approximately 468 megawatts (MW) of electricity.

The project is controversial. Cape Wind argues that the project will lower electricity costs to consumers, reduce emissions from power plants in the New England region, create more jobs on Cape Cod, and contribute to greater energy diversity and independence. Critics of the project are concerned about the high cost of wind-generated electricity, about environmental impacts and about the aesthetic effects of 130 windmills on the horizon, which they fear will deter tourists and depress land values.

The project is subject to an extensive regulatory review process, involving a number of federal, state and local regulatory authorities. Because the project would be sited in federal coastal waters, the Army Corps of Engineers, through its permitting authority, has a key role in this process. The Army Corps' guidelines recognize the importance of considering the "reasonable use expectations of the general public and waterfront landowners" in deciding whether to issue a permit for projects of this kind.[1]

Whether use of a public asset such as Nantucket Sound is "reasonable" or not depends in part on how, from a societal point of view, the benefits it would confer compare to the costs it would impose. This study reports the results of a systematic cost-benefit analysis of the siting of the proposed wind farm in the Sound.

This report addresses three major questions:

1. What are the economic costs and benefits of the Cape Wind proposal?
2. What are the financial costs and benefits of the project, from the point of view of Cape Wind?
3. Is the level of subsidy to the project appropriate?

To answer these questions we constructed a detailed cost-benefit and risk analysis of the windmill project.

2. Economic Costs and Benefits

An economic cost-benefit analysis identifies, measures and compares the resource benefits of a project with the resource costs. For instance, in the context of a wind power project, the economic benefits include the value of fossil fuels saved and emissions averted; however, subsidies to the project are transfers from one part of society to another, and do not represent economic benefits (although of course they represent financial benefits to the project's owners). We now turn to a systematic examination of the economic benefits and costs of the Cape Wind project.

The method we used was as follows: first we built a spreadsheet to determine the economic and financial benefits and costs of the project, using the best available information on all of the input variables (the price of fuel, the cost of construction, and so on). Many of the important input variables are either not known with certainty (e.g., the future price of green credits) or are inherently variable (e.g., the speed of the wind). For each of these variables we specified a *distribution* that reflects our judgment of the type and extent of their variability; the details are set out in the Appendix. We then took 10,000 random drawings from these distributions and for each drawing we recomputed the output variables, including the economic costs and benefits and the financial rate of return. The results reported below are the mean values that result from this exercise; the confidence intervals show the range within which we are 90% certain that the truth lies, based on our analysis and simulations.

Economic Benefits 1: Fuel Saved

The first benefit of the Cape Wind project is that it would reduce the need to generate electricity by other means. The main saving would be the ensuing reduction in fossil fuel consumption.

To measure the amount of fossil fuel saved one must begin by determining how much electricity the Cape Wind project would supply to the regional power grid. This depends on the rated capacity of the wind farm (468MW) and the pattern of wind speed during the year. Cape Wind claims that the wind speed (at the appropriate height) would average 8.89 meters per second (m/s) during the year (Cape Wind 2001). This is plausible, and is the number we begin with. An anemometer at 24.8 meters height in nearby Buzzards Bay found an average wind speed of 7.74 m/s during 1997-2001; adjusting for the fact that the hubs of the Cape Wind windmills would be 90 meters above sea level, one finds a wind speed of 9.30 m/s.[2]

Using information from Station 44018, a buoy located 30 nautical miles east of Nantucket, we determine the pattern of monthly wind speeds; we gross these up to give an average of 8.89 m/s (the wind speed reference by Cape Wind); and we use information from the RETScreen International Wind Energy Project Model (Canada 2000) to convert the average wind data into capacity utilization rates.[3] We estimate that the actual output of the wind farm would be 38.1% of its rated capacity. However, the equipment is expected to degrade slowly, by 0.8% annually reducing the actual capacity. This would be corrected by major rehabilitations of the drive train (every ten years) and the blades (every 15 years). In 2007, its first full year of operation, the wind farm is expected to produce 1.4 million MWh of electricity, equivalent to 0.94% of the electricity produced in New England, or 2.51% of that consumed in Massachusetts.[4]

The next step is to determine how much fossil fuel would be saved. Electricity from the wind farm would be fed into the New England power grid. Since the wind farm is not reliable enough to provide firm power – it is non-dispatchable – the grid would first take electricity from wind farms before turning to generating facilities that are further up the "bid stack" (i.e., have offered to supply electricity at non-zero prices). The regional Independent System Operator (ISO-New England) that runs the regional grid continues to add producers until demand is satisfied; the bid price of the last producer brought on line will then be the price paid to all producers by all purchasers. It follows that electricity from the wind farm will displace the "marginal" producers – in practice mainly those using natural gas, but also suppliers that use oil and coal. The precise producer whose production would be displaced at any given moment will vary from day to day and hour to hour. Information on who is the marginal producer is not made public.

We have assumed that all the wind-generated electricity will displace fossil fuel (and not nuclear or renewable power), and that it will reduce the use of natural gas, oil and coal in proportion to the expected marginal contributions to electricity production of these sources.[5]

The projected prices of fossil fuels come from the recent projections through 2025 made by the U.S. Energy Information Agency (EIA 2004). The EIA projects relatively little growth in real energy prices over the coming two decades. Here, as elsewhere, we use nominal dollars, and have inflated our projected prices and costs using a projected price index.

Having quantified the value of fuel savings, we discount it at 10% to 2004, and compare it to the similarly-discounted volume of electricity produced.[6] The result is a measure of the "levelized cost" of

fuel saved; in our baseline it amounts to 4.96 cents/kWh (see Table 1), or a total of $523.3 million (in present value terms).[7]

Economic Benefits 2: Less Capital Expenditure

The main benefit of wind power is the reduction in fossil fuel use by power plants whose output is displaced by wind-generated electricity. However, because wind power is unreliable, it is sometimes assumed that dispatchable backup generating capacity, roughly equivalent to the capacity of the wind farm, is still needed, in case there is a time when the wind does not blow.

Table 1: ***Economic Costs and Benefits of the Nantucket Sound Wind Farm Project***

	Net Present Value (at 10%)		Cents/kWh
	Mean	**90% confidence interval**	
		($ millions)	
Benefits	**735.5**	**626 – 853**	**6.97**
Of which:			
Fuel saved	523.3	455 – 599	4.96
Capital costs saved	97.9	75 – 120	0.92
Emissions reduced	107.4	55 – 176	1.02
Greater energy independence	6.8	2 – 13	0.06
Costs	**947.2**	**882 – 1,029**	**9.00**
Of which:			
Project itself	882.4	819 – 963	8.39
Grid integration	25.6	23 – 28	0.24
Environmental effects (using royalty rates)	39.2	35 – 44	0.37
Benefits – Costs	**(211.8)**	**(337) – (84)**	**(2.04)**
Costs using expected property value	**(1,523.2)**	(1,650) – (1,393)	
Costs using willingness to pay measure	**(176.5)**	(304) – (46)	

Note: Totals may not add exactly, due to rounding errors.
Based on 10,000 drawings from underlying distributions of the variables determining costs and benefits.

This is an unnecessarily cautious position. Simulation evidence from wind farms elsewhere in the United States suggests that electricity systems typically need only to maintain additional reserve capacity (spinning and non-spinning) of at most 20% of the rated capacity of the wind turbines, and possibly far less (Milligan 2001). This is because there is usually enough variability in the system to take up the slack when the turbines are becalmed.

In the case of the Cape Wind project there is another consideration: peak electricity demand in the region is in July and August, yet this is the time when the wind blows least. The capacity utilization of the wind turbines is estimated at 13% in July and 30% in August, compared to an annual average rate of 38%. This

limits the amount of other capacity that could be removed from the system when wind comes on stream. We assume that when Cape Wind is operating, one could avoid building gas-powered plants to the extent of 19.5% of the Cape Wind rated capacity. This is the average capacity for July and August (21.5%) reduced by 10% to provide backup reserve. The natural gas plants are assumed to have a capital cost of $500/kW (in 2002 prices; see NW Energy Coalition; BP; and Univ. of Alaska Fairbanks) and a 95% operating efficiency rate. Thus the wind farm would allow a saving of $97.9 million in capital costs elsewhere in the system, equivalent to 0.92 cents/kWh produced by the wind farm.

Economic Benefits 3: Lower Emissions

When wind power reduces fossil fuel use, it also indirectly contributes to cleaner air through lower emissions of sulfur oxides (SO_x), nitrogen oxides (NO_x) and particulates. The reduced emissions of carbon dioxide (CO_2) are believed to reduce the greenhouse effect and thereby moderate the effects of global warming, although the strength of these effects is a matter of considerable debate.

The independent system operator of New England (ISO-NE) has undertaken a "marginal emissions analysis" that asks what the emissions effects would have been if it had bought an additional 500MW of power at every point during a year. At each point in time, ISO-NE knows who the marginal power supplier would be, and how much pollution it would produce (ISO-NE 2003). This is the appropriate measure to use, given that power from Cape Wind would be a modest proportion (typically under 1%) of the total New England supply of electricity.[8] Using this information, we estimate that in 2007, the project would reduce CO_2 emissions by 855,630 metric tons, SO_x emissions by 2,280 metric tons, and NO_x emissions by 708 metric tons (Table 2).

The main benefit of lower emissions of SO_x, NO_x and particulates is a reduction in human mortality and morbidity. It is not easy to put a dollar value on these effects, and so estimates vary widely. We use the numbers reported by Levy et al. (1999); they are relatively recent, and are in line with figures for parts of New England that were published in another study by Levy et al. (2002). These studies also make sensible assumptions about the value of CO_2 emissions; many earlier researchers assumed, unrealistically, that such emissions should be valued at the cost of planting enough trees to offset these emissions.

Earth Tech (2002) also provides estimates of the pollutant emissions that would be displaced by the Cape Wind Project (see their Table 4-4), but the numbers are high; although the Cape Wind project would produce about 1% of the region's electricity, Earth Tech believes that it would displace more than 2% of

emissions. Emissions rates have fallen very rapidly in New England recently; between 1997 and 2002, emissions of SO_X fell by 65%, NO_X by 58%, and of CO_2 by 10%.

Although emissions from fossil fuel use are likely to continue falling as technology advances, we assume no such further improvements here. If anything, this leads to an overstatement of the emissions reductions that we attribute to the Cape Wind project.

We therefore use the most recent available figures as the base for computing the emissions-reducing effect of Cape Wind power, without allowing for future reductions in emissions from fossil fuel plants. The net result is that the present value of the reduction in emissions attributable to the Cape Wind project would be $107.4 million, or about 1.02 cents/kWh.

Table 2
Emissions avoided due to Cape Wind project

	Emissions avoided in 2007, metric tons	Value of avoided emissions (Levy et al. [a])	
		$ per metric ton	Total
SO_X	2,280	906	$2,226,253
NO_X	708	883	$673,572
CO_2	855,630	3.9	$3,596,900

Note: All figures are in 2003 dollars unless otherwise noted.
[a] Source: Levy JI, Hammitt JK, Yanagisawa Y, Spengler JD. "Development of a New Damage Function Model for Power Plants: Methodology and Applications." *Environmental Science and Technology* 33: 4364-4372 (1999).

Economic Benefits 4: Energy Independence

By using wind power, less oil would be used in the United States. Currently, 55% of the petroleum used in the country is imported, a figure that the U.S. Energy Information Agency expects to rise to almost 75% by 2025. This dependence on foreign oil has been blamed for some of the costs that the U.S. has incurred in the Middle East, particularly the Gulf War of 1991. Moore et al. (1997) put a price on this dependence that comes to about 8 cents per gallon of imported oil (adjusted to 2004 prices). Using this value, we find that the energy from the Cape Wind project may be associated with savings (in present value terms) of $6.8 million related to ensuring a reliable flow of oil to the country. This is equivalent to 0.06 cents/kWh.

Adding together the benefits of fuel saved, avoided investment, emissions reduced, and greater energy independence, we get a total equivalent to 6.97 cents/kWh. The present value of this benefit is $735.5 million, which is our measure of the economic benefit of the output of the Cape Wind project.

The Economic Costs

By far the largest economic cost of the Cape Wind project is the main investment in plant and equipment. We estimate the cost to be $1,554/kW, not including contingency costs or other up-front costs of preparation. This gives a total of $727 million, close to the "approximately $700 million" figure used by Global Insight (2003, p. 3) in a report prepared for Cape Wind, and represents a levelized cost of 6.6 cents/kWh.

The operating and maintenance costs of wind plants are relatively low, although by no means negligible. Global Insight (2003, p. 12) cites an annual cost of "approximately $16 million," which is the one we use here. Combining the present value of the capital and operating costs, with adjustments for initial development costs, contingencies and accounts payable, we find the present value of the project cost to be $882.4 million or 8.39 cents/kWh.

In addition to the cost of the project itself, there are costs related to the integration of wind power into the regional electricity grid. Since wind power is relatively unpredictable, other units must be available to provide power at very short notice ("regulation"), over a period of 10 minutes to several hours ("load following"), and over a period of several days ("load commitment"). This imposes fuel and operating costs on other operators, in effect to create enough reliability to accommodate wind power. Parsons et al. (2003) report integration costs of 0.18 cents/kWh. Using this rate, appropriately adjusted for inflation and discounted to 2004, gives a present value of $25.6 million or a levelized cost of 0.24 cents/kWh.

Most controversial are the environmental costs of siting the windmills in Nantucket Sound. In a companion study, the Beacon Hill Institute (2003) reported on the results of a survey of almost a thousand homeowners and tourists in the towns abutting Nantucket Sound in the summer of 2003. Among the key findings:

- Homeowners believed that the windmill project would reduce the value of property by $1.35 billion. If correct, this would be the appropriate figure to use, since in principle it capitalizes all the effects of the windmill project. It arguably provides an upper bound to the environmental costs of the project.
- Tourists and homeowners alike said that they thought Cape Wind should pay royalties; the average amount suggested was 7.86% of sales. This might be interpreted as the price that tourists and homeowners believe Cape Wind should pay in order to compensate for the possibly negative environmental effects of the project. These could include the costs of the broken view of the ocean, the impact on bird and marine life, the reduced recreational value of the Sound and potential safety issues for boats and planes.
- Respondents to the survey indicated a modest "willingness to pay" to ensure that the windmills would not be built.

Using the "royalties" measure, we find the environmental effects to total $39.2 million for a levelized cost of 0.37 cents/kWh.

This brings the total economic cost of the project to $947.2 million, or 9.0 cents/kWh. This is substantially larger than the benefits of $735.5 million, or 6.97 cents/kWh. The net result is that the economic costs would exceed the economic benefits by $211.8 million (in present value terms). The Nantucket Sound wind farm would cost more to society than it would ever give back, and the difference is large. It follows that, using economic criteria, the wind farm should not be built.

3. Financial Costs and Benefits

Even though it is not economically advisable, the windmill project is financially attractive. This is because it would receive heavy subsidies.

If the project were not subsidized, it would generate a rate of return on equity of about 1.1% and the net present value of the project, from the point of view of the owners, would be -$197.0 million. This computation is based on the cash flow to equity, and makes adjustments for accounts payable and receivable, debt servicing (assuming that 50% of the project is financed by debt) and taxes.

However, the project expects to receive subsidies from two sources. Starting in 2003, Massachusetts law states that 1% of electricity must come from new, renewable sources, or else pay to the state a penalty of 5 cents/kWh on this electricity.[9] The proportion due to come from renewables is set to rise over time.[10] Utilities can satisfy this RPS (Renewable Portfolio Standard) arrangement by buying "green credits" from a certified provider. Cape Wind will be a certified provider, so the question becomes one of what price it can expect to receive by selling its green credits.

Grace and Cory (2003) have projected the price of green credits through 2012; the figure is about 2.5 cents/kWh, and is not expected to rise much above this level because once the price premium on electricity reaches this point there are a number of attractive options for producing "green" electricity (e.g. biomass, landfill methane, etc.).

Cape Wind also hopes to benefit from a federal Renewable Electricity Production Credit (REPC). Congress is expected to reinstate such a credit in 2004, probably at a rate close to the 1.8 cents/kWh that prevailed in 2003. Strictly speaking, the REPC is a tax credit, and so is only useful for corporations that are profitable, but serious consideration is being given to making the credits transferable.

Financial and Economic Returns Reconciled

The results of the financial analysis are presented in Table 3. Even with green credits and the Renewable Electricity Production Credit, the estimated rate of return on equity is just 12.2%, which is modest.

The project requires *both* the green credits *and* the federal Renewable Electricity Production Credit in order to be financially viable. We assume that the REPC is either tradable (so that Cape Wind can in fact

use it to offset taxes), or that a profitable company will take on the project (and so have taxes against which to use the credits); if this is not the case, then the project will look financially weaker.

In short, the project is just about financially viable, but only because of the subsidies it will receive. These subsidies are large. In present-value terms:

- the Massachusetts green credit will transfer $157 million to Cape Wind, and
- the Federal Renewable Electricity Production Credit is worth $84 million to Cape Wind.

This is a combined subsidy of $241 million, equivalent to 3.33 cents/kWh.

Is the amount of subsidy appropriate?

Wind power is clean and it reduces the cost of energy dependence. In addition, Cape Wind has to pay taxes, which push the private return below the economic return. Therefore, the appropriate subsidy would bridge the gap between the unsubsidized revenue (4.73 cents/kWh) and the economic benefits (6.97 cents/kWh).[11] This gap, and therefore the appropriate subsidy, is 2.24 cents/kWh.[12] This is to be contrasted with the actual subsidy of 3.33 cents/kWh.

Table 3: **Financial Costs and Benefits of the Cape Wind project**

	Baseline	**No green credits**	**No Federal REPC**	**No credits or REPC**
NPV for firm at 10%, ($ millions)	**41.7**	**(115.1)**	**(42.6)**	**(197.0)**
Confidence interval for NPV ($ millions)	(78.1) – 158.5	(221) – (19)	(120) – 34	(251) – (149)
Rate of return on equity (%)	**12.2**	7.1[a]	9.0[a]	1.1[a]
Confidence interval for rate of return (%)	6.6 – 18.1	n.a.	n.a.	n.a.
Levelized revenue per kWh ($/kWh)	**8.06**	**5.51**	**7.25**	**4.73**
Basic Levelized costs/kWh ($/kWh)	**8.40**	**8.40**	**8.40**	**8.40**
Of which:				
Operation and maintenance	1.51	1.51	1.51	1.51
Capital costs	6.89	6.89	6.89	6.89

Notes: n.a. = rate of return could not be computed (because it would be negative) for a number of cases.

[a] These rates of return are based on our best single-point estimates, and not the Monte Carlo simulations; they are thus not strictly comparable with the return shown in the "Baseline" column.

Levelized revenue does not adjust for accounts receivable; and levelized costs do not adjust for accounts payable, cash reserves, or taxes.

The numbers in this table are based on 10,000 drawings from underlying distributions of the variables determining costs and benefits.

Even with the optimum subsidy of 2.24 cents/kWh, the Cape Wind project would not be viable. Yet wind projects are being built elsewhere in the country. The Massachusetts Renewable Portfolio Standard is similar to the one developed in Texas. Wiser and Langniss report that, in 2001, Texas suppliers were

delivering power to the grid for 3 cents/kWh. When we factor in the (then) 1.7 cents/kWh Federal Renewable Electricity Production Credit, it follows that West Texas producers were generating wind power for about 4.7 cents/kWh. Over ten wind projects totaling 930 MW were erected or under construction in Texas in 2001 alone.

The cost of producing wind power at the Texas sites – 4.7 cents/kWh – is substantially less than the 8.4 cents/kWh that it would cost Cape Wind to produce electricity in Nantucket Sound. The problem is not the wind – averaging 8.9 meters per second, it is stronger than in West Texas (8 meters per second). The difficulty is with the very high cost of construction, partly because the size of the turbines is exceptional, and partly because of the difficulty of working at sea.

In short, on-land wind power may still be a preferable option to an offshore wind farm. But there can be no presumption that the best place to site on-land wind turbines is in Massachusetts.

4. Robustness

It is reasonable to ask how robust these results are. To answer this question we began with a brief discussion of the sensitivity of our measures to changes in the variables, and then present the results of a complete risk analysis. The general conclusion is that the fundamental findings – private profitability and economic loss – appear to be robust.

Several factors affect both the economic and financial results. Among the most important:

- The findings are sensitive to the assumptions that are made about **wind speed**. If the average wind speed were 9.30 m/s[13] rather than the 8.89 m/s that we have assumed, then the rate of return on equity would rise by two percentage points, and the economic cost of the project would fall by 0.5 cents/kWh to 8.5 cents/kWh. However, this is still far higher than the economic benefit of 7.0 cents/kWh.
- Little would change if the **price of electricity** were assumed to remain unchanged (in real terms) over time rather than following the projections of the Energy Information Agency.
- If **operating and maintenance** costs are higher than assumed here (1.335 cents/kWh rather than 0.75 cents/kWh), the economic net present value would be even more negative, and the private return would fall by almost two percentage points.
- If the **cost of building** and erecting the windmills is higher than Cape Wind expects, and approaches recent European experience of $1,900/kW, then the economic cost of the electricity would rise to over 10.1 cents/kWh, and the private return on equity would fall by almost a third.[14]

The economic, but not financial, appraisal is affected by a few important factors:

- In valuing emissions, we used the same numbers as Levy et al. (1999), appropriately adjusted for inflation. However, if we use the numbers summarized in the Pace study (Ottinger et al. 1990), the economic benefits of wind power rise by 3.1 cents/kWh, bringing it to a cent above the economic cost of 9.0 cents/kWh. As mentioned earlier, the Pace numbers put a very high price on CO_2 emissions, because of the (not very reasonable) assumption that the best alternative is planting trees to offset the CO_2.
- The Energy Information Administration forecasts lower real energy prices in the future than were experienced in 2003. If one assumes that the real prices of 2003 persist through the end of the project, then the benefits of the wind power rise by a cent, but still fall short of the costs (9.0 cents/kWh).

- Using a higher social discount rate – 12% instead of 10% – would make the project economically even less attractive, essentially because the benefits, which accrue far into the future, now have to be more heavily discounted.

A number of factors influence the financial, but not the economic results. These include:

- The price of the Massachusetts green credits. If credits sell for $10 per MWh less than expected, the private profitability of the project would fall by three percentage points.
- If the Federal Renewable Electricity Production Credit were to last for five years rather than ten, this would lower the profitability of the project by four percentage points.
- The project is risky – prices are uncertain, the technology is untested (for such large turbines) – and it is possible that Cape Wind could only finance 40% with debt, rather than the 50% that we have assumed. This would lower the return on equity by about two percentage points.

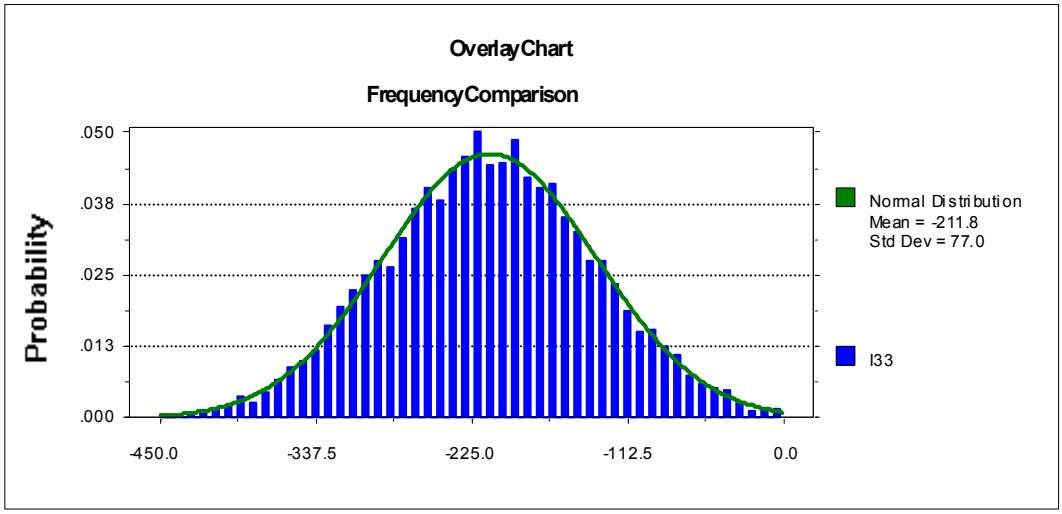
The sensitivity analysis is useful, and it is interesting that in only one case does one see a reversal of our basic result, which is that the project is economically undesirable.

However, a better approach would be to undertake a "Monte Carlo analysis," which sets a distribution of outcomes for each of the main variables, and then simulates the results. This gives a better sense of what outcomes are plausible (rather than merely possible).

For instance, we assume that the capital costs of the project could be as low as $1,450/kW and as high as $1,900/kW, with the most plausible value being $1,554/kW; we also suppose that this distribution has a triangular shape. Or again, we assume that there is a 50% probability that the project will be finance half with equity and half with debt, and 25% probabilities that the equity proportion would be 55% or 60% respectively. The full set of assumptions is shown in the Appendix.

We then drew 10,000 random samples from the distributions, and computed the variables of interest (rates of return, net present value, etc.). This allowed us to compute a distribution of outcomes, like the one shown here in Figure 1, which shows the net present value of benefits minus costs, for the economic analysis. The best-fitting distribution turned out to be a normal distribution with a mean of -$212 million and a standard deviation of $77 million.

Figure 1. **Distribution of Net Present Value of Net Economic Benefits ($ million)**

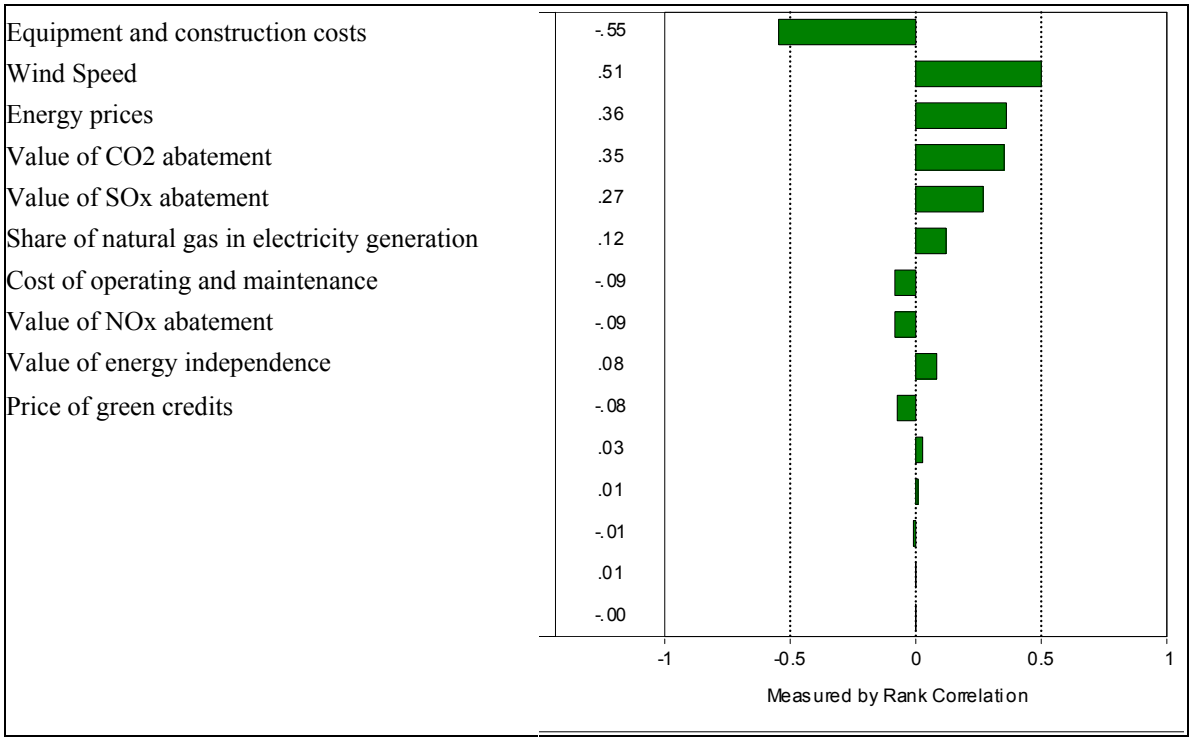


The most important feature of this risk analysis is that it allows us to compute confidence intervals for our target variables. These are shown in Tables 1 and 2. Thus the 90% confidence interval for the NPV of net economic benefits is -$337 million to -$84 million (Table 1); in other words, we are 90% confident that the true result lies inside this band. It is also clear that the net economic benefits are negative. In other words, our conclusion that the project is not economically worthwhile is robust.

The analysis also helps to highlight the risks that face investors. With 90% probability, we expect the financial return on equity to be somewhere between 6.6% and 18.1%, with an expected value of 12.2%. This is a wide interval; a nominal return of 6.6% would be disappointing, but a return of 18.1% would be well worthwhile. Indeed, we estimate that there is a 30.0% probability that the project will lose money for its shareholders; a 12.0% probability that the project will lose $50 million or more.

The risk analysis is good for one other thing: it helps identify the input variables that are most important. This is done in the sensitivity chart (or "tornado graph") in Figure 2. The benefits of wind power are lower if construction costs are higher, and the relationship between the two is close and therefore powerful. Other important influences on the economic value of the project are the speed of the wind; the level of future energy prices; and the value that one puts on reducing pollution. These are all variables that need particular attention to ensure that they are as accurate as possible.[15]

Figure 2: Sensitivity Chart
Target variable: NPV of Net Economic Benefits



5. Jobs

In our analysis of the benefits and costs of the Cape Wind project, we have made no specific mention of job creation. This is because jobs represent a cost, rather than a benefit, and so are included already in the project expenses. Jobs represent a cost because people have to be paid for the inconvenience, exertion and discipline that they demand.

However, it is widely believed that job creation is indeed desirable. If this is the case, how well does the Cape Wind project fare?

The Lexington-based firm Global Insight, at the request of Cape Wind Associates, developed an "Economic Impact Analysis" of the wind farm project in which considerable attention was paid to the job-creation effects in Massachusetts (Global Insight 2003). Using the IMPLAN input-output model for Massachusetts, they found that

- 142 jobs would be created directly during the building phase, both in manufacturing and assembly as well as in construction and installation, in Massachusetts. When the indirect effects (via project purchases made locally) and induced effects (when the newly-employed workers spend their money locally) are factored in, the total number of jobs created during this 27-month phase would be between 597 and 1,013.
- 50 jobs would be created to cover the operation and maintenance of the windmills, 45 of them going to Massachusetts residents. When the indirect and induced effects are added, total employment in the state would rise permanently by 154.

Even if one accepts these figures (and the high multiplier effects that they imply), they are incomplete, because they do not take into account the effect of the wind farm on tourism.

In late summer 2003, the Beacon Hill Institute (BHI) commissioned a survey of 499 tourists in those towns on Cape Cod and Martha's Vineyard that have a clear sight of the wind farm (BHI 2003). The relevant findings of that study were that

- 3.2% of tourists said they would spend an average of 2.9 fewer days on the Cape if the windmills were built;
- a further 1.8% said they would not visit at all; and
- 1.0% of tourists said they would stay longer on the Cape, remaining an extra 13 days on average.

The study also estimated that a number of tourists would visit the Cape because of the windmills, and that this would boost visits by about 0.6%.[16] By combining these numbers with information on tourist spending (also from the survey) and annual tourist visits (3.6 million to the affected towns), the BHI report estimated that total spending tourist would fall by between $57 million and $123 million annually.

The BHI study then applied multipliers from the Regional Input-Output Modeling System (RIMS II) model of the Bureau of Economic Analysis to measure the effects on output and employment. The RIMS II multipliers take into account the indirect and induced effects as well as the immediate effects of the spending. The important result is that the number of jobs would fall by between 1,173 and 2,533 (BHI 2003, p.14). These are large effects in the context of the local economy.

Therefore, even if we allow for the 154 new permanent jobs predicted by the Global Insight study, the net effect would be ***that the Cape and Islands could be expected to lose at least 1,000 jobs.***

6. Electricity Prices and the Consumer

In a report prepared for Cape Wind, LaCapra Associates (2002) argues that the wind farm would "lead to savings for the New England electricity market of approximately $25 million per year for the first five years of operation." An estimated $15 million of these savings would go to commercial electricity customers, $2.5 million to industrial users, and $7.5 million to residential consumers.

The argument is as follows. Currently, producers offer electricity to the regional grid at prices that they set, but which will certainly at least cover their marginal costs of production (i.e. the additional costs, such as fuel, that are incurred when they supply more electricity). The operators of ISO-NE stack the bids from lowest to highest price; if electricity demand rises, they will move up the bid stack, buying electricity at a higher price. All producers are paid the price that is determined by the supplier chosen at the margin.

Electricity from Cape Wind would have a negligible marginal cost, and so would be chosen first by ISO-NE operators. The effect would be to displace high-cost operators at the top of the bid stack, so that some of the time a lower-price plant would become the marginal supplier. This would result in a lower average price for electricity, creating savings that would be passed on to consumers. In some recent years during the summer, when demand for electricity is high, the slope of the bid stack was very steep at the top.

LaCapra Associates used a utility dispatch simulation program (PROSYM) to quantify the effect of Cape Wind electricity on the price of electricity, using recent data from the NEPOOL bid stack and loads from 1999 as inputs. They used the model first to simulate the regional electricity market for 2005-2009 "reflecting recent long term planning assumptions", and then to simulate the effects when "the Cape Wind project is added to the New England supply." By comparing the two simulations, they estimated the cost savings at $25 million per year.

Two questions arise from this discussion: first, are the findings plausible? And second, does the $25 million represent an economic benefit that our analysis needs to include?

The savings are plausible for one year only

A $25 million reduction in the cost of electricity to users is plausible for the first year in which Cape Wind operates. However, we do not believe that the project can take credit for suppressing the price of electricity for more than one year. There are two reasons for this. First, electricity demand in the region is rising by at least 1% per year, so that within a year demand will have expanded to fully absorb the expected production from the Cape Wind project. But any further increases in the price of electricity will elicit increased supply, because (and this is our second point), the supply of electricity is essentially completely elastic. With Cape Wind coming on line, other producers may delay their investments for a year, but once the market tightens again, they will prevent the price from rising any further, and it is they, rather than the Cape Wind project, that should get credit for preventing any further rises in the price.

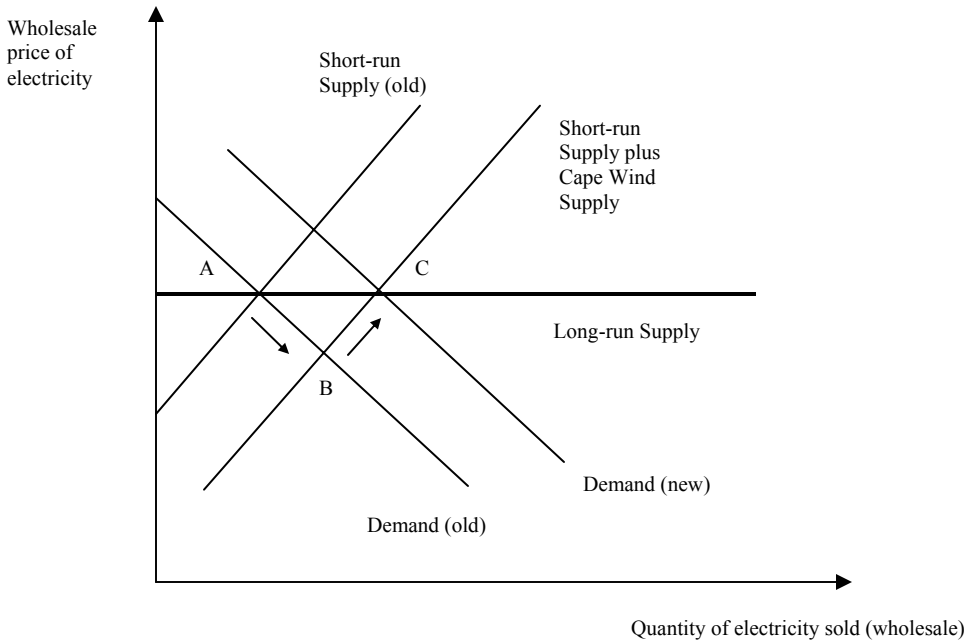
The situation is summarized in Figure 3. Initially, the market is at point A. When the Cape Wind project comes on line, we move to B, and the price of electricity falls. But over the course of a year, demand rises to fully absorb Cape Wind production. Any further rise in demand would push up the price, and supply would expand along the horizontal long-run supply curve, from point C onwards.

In order to simulate this effect using PROSYM, it would have been necessary to change the "long term planning assumptions" in reaction to the arrival of power from the Cape Wind project. Otherwise one would have to apply the same logic to all electricity producers in the region – since all are somewhere in the bid stack – and argue that they all should be given credit for generating savings to consumers, for a total of about $2.5 billion annually.[17]

The savings to electricity users represent transfers, not economic benefits

To the extent that the Cape Wind project lowers the price of electricity, the main effects are to transfer revenue from other power generators (which now get a lower price) to the public (which pays less). Certainly, those producers who now do not sell their electricity to the regional grid will incur lower costs (mainly of fuel and possibly of equipment), but these have already been taken into account in our economic cost-benefit analysis.

Figure 3. ***The Market for Electricity***



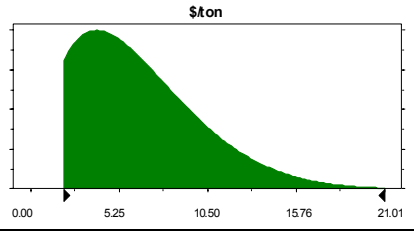
Appendix: Distributions of Risk Variables

Value of abated CO_2, $/ton

Beta distribution with parameters:

Alpha	2.00
Beta	8.00
Scale	31.20

Selected range is from 1.95 to +Infinity
Mean value in simulation was 6.83

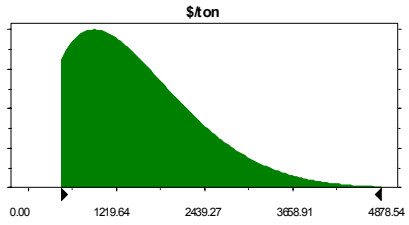


Value of abated SO_x, $/ton

Beta distribution with parameters:

Alpha	2.00
Beta	8.00
Scale	7245.36

Selected range is from 452.33 to +Infinity
Mean value in simulation was 1582.32

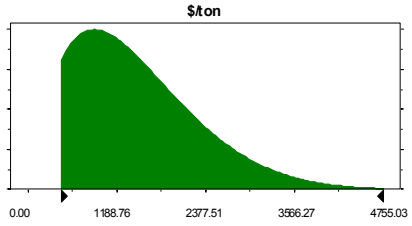


Value of abated NO_x, $/ton

Beta distribution with parameters:

Alpha	2.00
Beta	8.00
Scale	7061.92

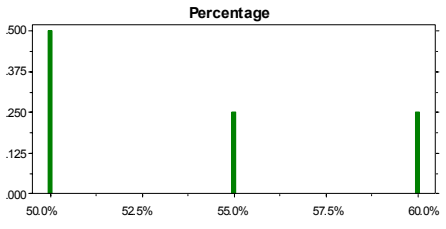
Selected range is from 442.37 to +Infinity
Mean value in simulation was 1562.20



Percentage of financing through equity

Custom distribution with parameters:		Relative Prob.
Single point	50.0%	0.50
Single point	55.0%	0.25
Single point	60.0%	0.25
Total Relative Probability		1.00

Mean value in simulation was 53.8%

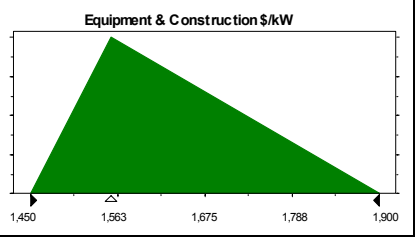


Equipment & Construction costs, $/kW

Triangular distribution with parameters:

Minimum	1,450
Likeliest	1,554
Maximum	1,900

Selected range is from 1,450 to 1,900
Mean value in simulation was 1,636



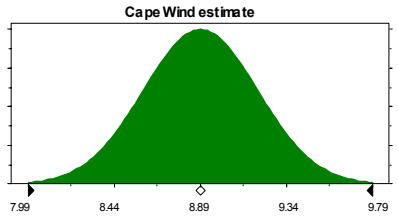
Distribution of Annual Average Wind Speed, m/s

Normal distribution with parameters:

Mean	8.89
Standard Dev.	0.30

Selected range is from -Infinity to +Infinity

Mean value in simulation was 8.89



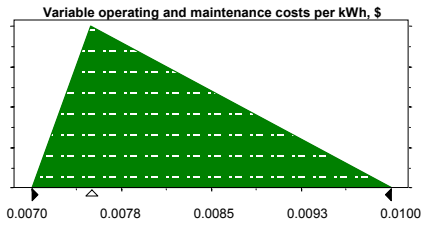
Variable operating and maintenance costs per kWh, $

Triangular distribution with parameters:

Minimum	0.0070
Likeliest	0.0075
Maximum	0.0100

Selected range is from 0.0070 to 0.0100

Mean value in simulation was 0.0082



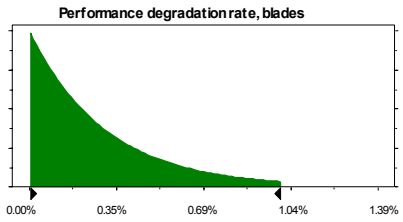
Performance degradation rate, blades

Gamma distribution with parameters:

Location	0.00%
Scale	0.30%
Shape	1

Selected range is from 0.01% to 1.00%

Mean value in simulation was 0.27%



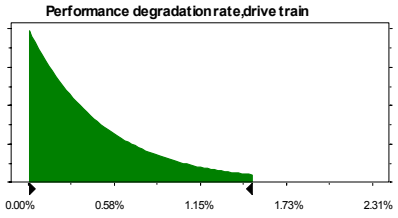
Performance degradation rate,drive train

Gamma distribution with parameters:

Location	0.00%
Scale	0.50%
Shape	1

Selected range is from 0.01% to 1.50%

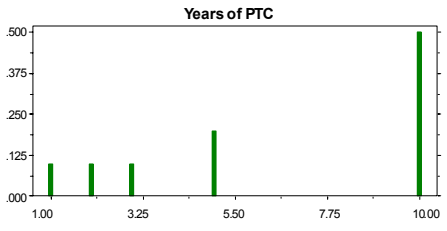
Mean value in simulation was 0.43%



Years of Federal Renewables Production (Tax) Credit

Custom distribution with parameters:		Relative prob.
Single point	1.00	0.10
Single point	2.00	0.10
Single point	3.00	0.10
Single point	5.00	0.20
Single point	10.00	0.50
Total Relative Probability		1.00

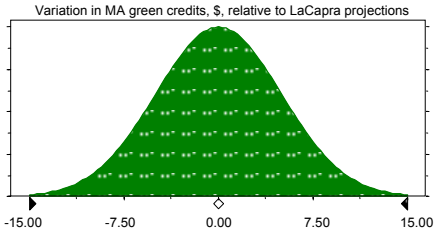
Mean value in simulation was 6.62



Variation in MA green credits, $, relative to LaCapra projections

Normal distribution
with parameters:
Mean 0.00
Standard Dev. 5.00

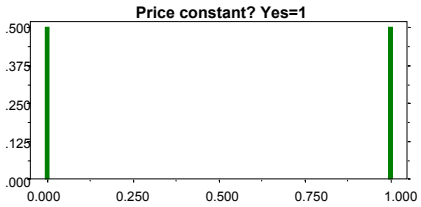
Selected range is from -Infinity to +Infinity
Mean value in simulation was 0.06



Is real price of electricity constant (yes=1) or does it follow EIA forecasts?

Custom distribution with parameters:		Relative Prob.
Single point	0.000	0.50
Single point	1.000	0.50
Total Relative Probability		1.00

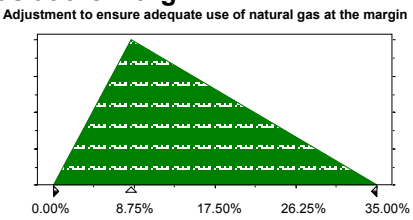
Mean value in simulation was 53.8%



Adjustment to ensure adequate use of natural gas at the margin

Triangular distribution with parameters:
Minimum 0.00%
Likeliest 8.40%
Maximum 35.00%

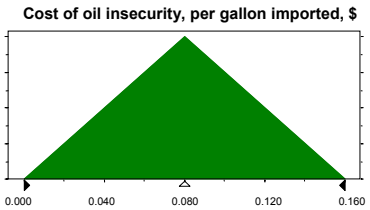
Selected range is from 0.00% to 35.00%
Mean value in simulation was 14.40%



Cost of oil insecurity, per gallon imported, $

Triangular distribution with parameters:
Minimum 0.000
Likeliest 0.080
Maximum 0.160

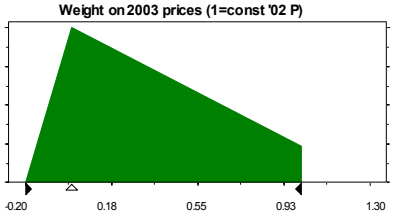
Selected range is from 0.000 to 0.160
Mean value in simulation was 0.080



Weight on 2003 real fuel prices relative to EIA projections

Triangular distribution with parameters:
Minimum -0.20
Likeliest 0.00
Maximum 1.30

Selected range is from -0.20 to 1.00
Mean value in simulation was 0.33



Endnotes

[1] U.S. Army Corps of Engineers guidelines referenced at http://www.nae.usace.army.mil/reg/reg2.htm.
[2] At greater elevations, where there is less shearing, wind speeds are higher. The relationship is captured by the equation (S2/S1) = *a*.(H2/H1)^(1/7), where S1 and S2 are the wind speeds at heights 1 (low) and 2 (high), H1 and H2 are the heights, and *a* is a constant.
[3] Even if the wind speed averages 3 m/s, which would normally not suffice to turn the windmill, there will be periods when the wind is blowing strongly enough. The RETScreen model applies a Rayleigh distribution in order to estimate how much effective production one can obtain, given an average wind speed.
[4] The EIA provides the most recent information on Massachusetts' electricity generation. See http://www.eia.doe.gov/cneaf/electricity/epm/table1_6_b.html.
[5] The projected average level of use of oil, natural gas and coal come from the EIA (2003). We make an adjustment that gives a somewhat higher weight, an extra 8.4 percentage points, to natural gas. This is because of the heavy use of natural gas as the marginal fuel. The proportion (i.e. 8.4%) is designed to ensure that the marginal emissions are consistent with recent experience.
[6] This discount equals the real rate (7%) recommended by the U.S. Office of Management and Budget plus the assumed rate of inflation (3%) over the life of the project. Source: http://www.whitehouse.gov/omb/circulars/a094/a094.html#8.
[7] The nominal levelized cost is the cost of electricity "expressed on an equal, per-unit basis, taking into account an appropriate interest rate that includes the effects of inflation." Source: http://www.bpa.gov/Corporate/KCC/defn/defnsmal/l.htm [Accessed March 5, 2004.]
[8] From the EIA we obtained information on emissions by fuel source; we used this information to account for the changing mix of fuel that is expected to occur over the coming 25 years.
[9] This amount is indexed to inflation. In 2004, the amount was adjusted to 5.41 cents/kWh. http://www.state.ma.us/doer/rps/index.htm
[10] The proportion of electricity that is to come from new renewable sources is set to rise by half a percentage point per year through 2009 (when it will amount to 4% of the total), and to rise by a percentage point per year thereafter.
[11] This is in line with the quantifiable external costs of energy systems reported by Bertel and Fraser (2002), which were 1.1 eurocents/kWh for gas and 2.6 eurocents/kWh for coal. Given that 57% of regional fossil-fuel generated electricity comes from natural gas, and the rest from oil and coal, this would imply an external cost of 1.75 eurocents/kWh for New England.
[12] Table 1 shows that the external benefits attributable to the project – reduced emissions, and greater energy independence – together were valued at 1.08 cents/kWh ($114.2 million). It might also be argued that this is the appropriate level of subsidy.
[13] An anemometer at 24.8 meters height in nearby Buzzards Bay found an average wind speed of 7.74 m/s during 1997-2001; adjusting for the fact that the hubs of the Cape Wind windmills would be 90 meters above sea level, one finds a wind speed of 9.30 m/s. At greater elevations, where there is less shearing, wind speeds are higher. The relationship is captured by the equation (S2/S1) = *a*.(H2/H1)^(1/7), where S1 and S2 are the wind speeds at heights 1 (low) and 2 (high), H1 and H2 are the heights, and *a* is a constant.
[14] The construction costs at Horns Rev in Denmark, the largest offshore wind farm in Europe, came to 268 million euro, of which 40 million euro were interconnection costs; at an exchange rate of 1.3 euro/dollar, this totals $348 million. Horns Rev consists of 80 two-megawatt turbines, for a total capacity of 160 MW. This represents a cost of $2,175 per kW (or $1,850 if interconnection costs are excluded). Based on these numbers, we have taken $1,900/kW as an upper bound to the construction costs in Nantucket Sound. Source: http://www.jxj.com/magsandj/rew/2002_03/horns.html.
[15] There are a great many costs and benefits that can be associated with the Cape Wind project. The project entails the installation of a large facility in the middle of a body of water unsurpassable for its value as a tourist attraction, a vista for homeowners and a home to marine wildlife. While the "private" (or financial) costs and benefits of such a project are relatively easy to determine, the external costs and benefits (those associated mainly with environmental effects) are another matter. No cost-benefit analysis could account for all of these externalities. We believe, however, that, by recognizing the benefits from reduced emissions and increased energy independence, we have captured the most important external benefits of the wind farm. Some might question our omission of reduced oil spills as an additional benefit. In fact, however, the costs of such spills are already internalized by oil transporters and are therefore accounted for in our analysis. If anything, we probably underestimate the external costs of the

project by not incorporating any measure of the costs of possible boating or aircraft accidents or of the prospective harm to commercial fishing.

[16] Roughly, for every two tourists that say they would spend less time on the Cape, another one would not visit at all. Applying a similar proportion to those who say they would spend more time on the Cape, we estimate that there would be a 0.58% increase in visits to the Cape, attributable entirely to the presence of the windmills.

[17] Cape Wind production will amount to about 1% of New England supply and, it is argued, would reduce electricity prices by $25 million annually; grossing this up by a factor of 100 gives $2.5 billion.

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About the Beacon Hill Institute

Founded in 1991, BHI is an independent, nonpartisan economic research organization, located within Suffolk University in Boston, that applies a market-clearing approach to the analysis of tax, fiscal and regulatory issues. In addition to analyzing tax policy, we study issues including education spending, charitable tax incentives, universal health care, tort reform and economic competitiveness. BHI develops innovative solutions and applies economic analysis to public-policy issues affecting the states and the nation.

About the Authors

Douglas Giuffre, MSEP, is an Economist at the Beacon Hill Institute. He holds an MS in Economic Policy from Suffolk University. He has written on electricity demand.

Jonathan Haughton, CFA, PhD, is Senior Economist at the Beacon Hill Institute and Associate Professor of Economics at Suffolk University. He holds a doctorate in economics from Harvard University and has published widely in refereed journals on economic development and taxation.

David G. Tuerck, **PhD**, is Executive Director of the Beacon Hill Institute for Public Policy Research at Suffolk University in Boston, MA, where he also serves as Chairman and Professor of Economics. He holds a doctorate in economics from the University of Virginia, and has written extensively on issues of taxation and public economics.

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EXHIBIT 4

Deficiencies in the Corps' Economic Analysis of the Cape Wind Project: Comments on the Draft EIS/EIR

Prepared for

Alliance to Protect Nantucket Sound

by

ECONorthwest
99 W. Tenth, Suite 400
Eugene, OR 97401
(541) 687-0051

February 2005

I B AC

On November 9, 2004, the U.S. Army Corps of Engineers, New England District (Corps) published a Draft Environmental Impact Statement /Draft Environmental Impact Report (Draft EIS/EIR) on the proposed Cape Wind energy project in Nantucket Sound, Massachusetts. The proposed project, if implemented, would result in the installation and operation of 130 offshore wind turbines to generate electricity on 24 square miles of federal lands approximately 4 miles from Yarmouth, 11 miles from Nantucket, and 5.5 miles from Marthas Vineyard. The purpose of the Draft EIS/EIR is to assess the environmental impacts, including the economic impacts of the proposed project.

The Alliance to Protect Nantucket Sound asked ECONorthwest to determine if the Draft EIS/EIR fully and accurately describes the potential economic impacts of the proposed project in a manner consistent with the professional, analytical standards commonly applied to the underlying economic issues. This report responds to that request. Our findings will be submitted as comments on the Draft EIS/EIR to the Corps, which we expect will consider them as it prepares its final analysis of the proposed project. This report summarizes the results of our analysis to date. As we review additional information we may revise our opinions, add additional opinions, or both.

For more information regarding the contents of this report, please contact:

Ernie Niemi, ECONorthwest
99 West 10th Avenue, Suite 400,
Eugene, Oregon 97401
phone: 541-687-0051
email: niemi@eugene.econw.com

II. SUMMARY OF FINDINGS AND COMMENTS

Before issuing a permit for the proposed Cape Wind project (Project), the Corps has an obligation to demonstrate, with reasonable certainty, that its benefits outweigh its costs. To some, this is a foregone conclusion. They see that electricity from the Project's wind-powered generators would necessarily displace electricity from generators that burn fossil fuel, resulting in reduced emissions of carbon dioxide, which scientists have associated with global climate change, as well as in healthier lives for families no longer exposed to other, harmful, pollutants from fuel-burning generators.

Closer examination reveals, however, that many of these benefits probably would not materialize. Instead of displacing electricity generated from fossil fuels, for example, the Project probably would displace electricity from other renewable sources of energy. Moreover, whatever the project's benefits, they would not come free-of-charge. The generators, themselves, will be expensive to build and costly to operate. And, as they do some good things for the environment and for communities, they will do some harmful things as well. The Project's costs are sufficiently large and diverse that one cannot conclude that its benefits outweigh its costs, or vice versa, without a thorough analysis, taking into account all relevant factors.

The Corps has acknowledged (p. 7-3) its obligation to provide such an accounting and to demonstrate that issuing the permit would be in the public interest. To satisfy this obligation, it must balance "the benefit which may reasonably accrue from the proposal against its reasonably foreseeable detriments" giving consideration to "[a]ll factors which may be relevant."

The Corps has failed to satisfy its obligation. Major deficiencies in five general areas cause the Draft EIS/EIR to give an incomplete and inaccurate picture of the Project's reasonably foreseeable benefits and costs. Table 1 summarizes these deficiencies, steps the Corps must take to correct them deficiencies, and the anticipated consequences of doing so. The available evidence suggests that, if the Corps were to account fully for all relevant factors, its analysis would show that the Project's economic costs exceed its benefits.

We emphasize that these findings are specific to this Draft EIS/EIR and the particular configuration, location, timing, and economic context of the Cape wind project. The findings should not be used to draw general inferences regarding the benefits and costs of other wind projects or of projects using renewable-energy sources other than wind. Indeed, an important lesson to be drawn from our review of the Draft EIS/EIR is that the details" configuration, location, timing, and economic context" of an electricity-generating facility should not be set aside when evaluating, from an economics perspective, whether or not the facility is in the public interest.

Table 1. Summary of Findings: Major Deficiencies in the Corps' Analysis, Recommended Corrections, and Anticipated Consequences

Element of Analysis	Deficiency in Corps' Analysis	Recommended Correction	Anticipated Consequence
Deficiencies in analytical framework and failure to consider all relevant factors			
Analytical framework	Corps ignored federal *Principles & Guidelines* for economic analysis of decisions affecting water and land resources, the agency's own economic manuals, and guidance provided by others.	Conduct analysis consistent with commonly applied professional standards. Apply *Principles & Guidelines* and other applicable guidance.	Corps will show all relevant economic information re the Project's relationship to the public interest, calculate the Project's net economic benefits (or net economic costs), and fully describe economic risks.
Deficiencies in the analysis of the project's economic benefits			
Electricity benefits	Corps assumed Project would compete in open market, displace electricity from fossil-fuel-fired generators, and reduce price consumers' pay for electricity.	Recognize the Project probably would compete in a niche market and displace electricity from other renewable resources, not from fossil-fuel-fired generators. Impacts on consumers' payments for electricity would be limited.	Calculation of benefits will fall from $25 million per year to near zero.
Human-health benefits	Corps assumed Project would displace emissions of harmful pollutants from fossil-fuel-fired generators and, hence, improve air quality and lower pollution-related sickness. Calculated monetary savings from improved health using data that are out of date or otherwise inappropriate.	Recognize the Project probably would not displace electricity from fossil-fuel-fired generators. Even if it did, cap-and-trade systems mean any reduction in emissions of SO_2 and NO_x would be offset by increases elsewhere, with no net improvement in regional air quality. Reduced emissions of particulates, if any, could improve air quality and reduce related sickness.	Calculation of human-health benefits will fall from $53 million per year to a much smaller number. Benefits would come from reductions, if any, in particulate emissions, and from possible reductions in the cost of meeting SO_2 and NO_x targets.
Greenhouse-gas benefits	Corps did not calculate these benefits, but implicitly assumed they would exist, as it assumed the Project would displace emissions of CO_2 from fossil-fuel-fired generators.	Recognize the Project probably would not displace electricity from fossil-fuel-fired generators. Further analysis required to determine impacts if it displaced other renewables.	Greenhouse-gas benefits will be much smaller than what is implicit in the Corps' analysis.
Deficiencies in the analysis of the project's direct economic costs			
Direct Project costs	Corps disregarded evidence regarding decommissioning costs, and did not estimate costs of occupying public lands and waters.	Consider the full costs of public lands and waters occupied by the Project. Consider all relevant evidence regarding decommissioning costs	Calculation of direct Project costs will increase. Decommissioning costs of $6 million may rise 2-5 times, or more. The value of public resources occupied by the Project will increase from zero.

Table 1, cont. Summary of Findings: Major Deficiencies in the Corps' Analysis, Recommended Corrections, and Anticipated Consequences

Element of Analysis	Deficiency in Corps' Analysis	Recommended Correction	Anticipated Consequence
Deficiencies in the analysis of the costs the Project would impose on others			
Costs imposed on commercial fishing industry	Corps assumes that spacing of turbines would be wide enough that they would not interfere with commercial fishing.	Consider all relevant evidence, including statements from fishermen about the risks of fishing among the structures and the fact that fishing is commonly restricted near wind turbines in Europe.	Calculation of costs will increase to reflect hazardous conditions, or the lost net output if fishing should be restricted.
Costs imposed on recreationists & tourists	Corps considered only evidence favorable to the Project and concluded there would be no adverse impact.	Consider all relevant evidence, which shows potential negative impact on recreationists & tourists. Calculate economic loss to them.	Calculation of costs will show potential annual losses are not trivial.
Costs imposed on property owners	Corps considered only evidence favorable to the Project and concluded there would be no adverse impact.	Consider all relevant evidence, which shows the Project may have a negative impact on property values. Calculate economic loss.	Calculation of costs will show potential annual losses are not trivial.
Negative impacts on the ecosystem's intrinsic value.	Corps has not considered these costs. Evidence indicates these costs may be non-trivial.	Evaluate the Project's potential negative impacts on the ecosystem's intrinsic value.	Calculation of costs will show potential annual losses are not trivial.
Jeopardy to state, local, and private investments in the ecosystem	Corps has not considered these costs. MA has long recommended a ban on industrialization of this area. Investments in the ecosystem are substantial.	Evaluate the Project's potential negative impacts on state, local and private investments.	Calculation of costs will show potential annual losses are not trivial.
Deficiencies in the analysis of the economic risks associated with the Project			
Economic risk associated with the Project	Corps has not considered the economic consequences if something should go wrong.	Evaluate financial risks borne by Project Sponsor, including risks of technological failure, major accidents, and reduction in governmental support. Evaluate economic value of ecological risks, including risks of major accidents, such as oil spills, potential bird kills, and ecological consequences of noise, vibration, and electromagnetic fields.	Analysis of risks will show potential costs are not trivial.
Economic costs associated with navigational hazards	Without considering all the relevant evidence, the Corps concluded the Project would not induce an accident or worsen the consequences of any accident induced by other factors.	Evaluate all relevant evidence, including potentially applicable hazard-management standards that might restrict vessel travel.	Calculation of costs will show the costs of potential accidents, should they occur, and the costs of restricting traffic in the vicinity.

III. DEFICIENCIES IN THE CORPS' ANALYTICAL FRAMEWORK AND FAILURE TO CONSIDER ALL RELEVANT FACTORS

Table 2 identifies major deficiencies in the Corps' framework for analyzing the Project's economic effects and determining if its economic benefits outweigh its economic costs. These deficiencies originate with the Corps' failure, at the inception of its analysis, to define appropriate standards applicable to the task and to develop analytical methods, evaluative criteria consistent with the standards. The absence of an appropriate analytical framework contributes to the Corps' failure to consider all the relevant factors regarding the Project's economic effects.

A. LACK OF AN ANALYTICAL FRAMEWORK CONSISTENT WITH PROFESSIONAL STANDARDS

The most fundamental deficiency in the Corps' economic analysis is the total absence of any analytical framework whatsoever. The bulk of the Corps' economic analysis consists of two studies, prepared by contractors for the Project Sponsor, that address issues of concern to it: the amount it would receive for the electricity it generates and the Project's positive impacts on jobs, incomes, and the like (Appendices 5.16-A and 5.16-B). To these, the Corps has added a modest amount of additional work that generally has a similar focus, looking at the Project with a primary concern for the Project's economic viability for the Project Sponsor rather than for whether or not the Project is in the public interest.

For example, in section '3.4.3.3.2 Economic Analysis' the Corps considers five variables that it asserts determine the 'economic viability of an alternative site': (1) the Sponsor's capital cost of constructing the facility; (2) the installed capacity of the proposed facility built by the Sponsor; (3) the wind regime at the site; (4) the net power production; and (5) the Sponsor's operation and maintenance costs. These variables, in effect, define 'Economic Analysis' from the perspective of Project Sponsor's interest rather than the general public interest. This section does not contain any discussion of the Project's economic effects on the general public interest.

Indeed, the Corps never builds the foundation essential to any reliable economic analysis. Nowhere does it define what the public interest is with respect to the Project's economic effects or state the evaluative criteria appropriate for deciding if the Project is in, or not in, the public interest. Nor does it describe the professional standards for developing reliable information to which the evaluative criteria can be applied. Absent this foundation, it is impossible to develop' and the Corps' analysis lacks' an analytical framework aimed at providing results to which the evaluative criteria can be applied and a decision justified.

Table 2. Summary of Deficiencies in the Corps' Analytical Framework and Its Failure to Consider All Relevant Factors

Analytical Component	Deficiency
Overall framework consistent with commonly accepted professional standards	Missing
Definition of the public interest regarding the Project's economic effects	Missing
Definition of a criterion for deciding if the Project's benefits outweigh its costs	Missing
Definition of conceptual basis for identifying and measuring the Project's benefits and costs consistent with the criterion	Missing
Framework for analysis of the project's externalities	Missing
Framework for analysis of the non-market goods and services affected by the Project	Missing
Framework for economic analysis of the Project's impacts on the ecosystem of Nantucket Sound	Missing
Framework for analysis of future economic and ecological conditions	Missing
Framework for analysis of the economic risks associated with the Project	Missing
Consideration of all relevant economic factors regarding the Project's economic effects	Missing
The economic benefits and costs for the Project Sponsor	Incomplete
The Project's economic externalties: the costs it will impose on others	Incomplete
The Project's effects on economic value of non-market goods and services	Missing
The economic values of the Project's effects on the ecosystem of Nantucket Sound	Missing
Foreseeable changes in the Project's benefits relative to its costs	Missing
Economic risks associated with the Project	Missing
Calculation of national benefits and costs	Missing
Calculation of benefit-to-cost ratio	Missing

The Corps' failure to build this foundation stands in stark contrast with common practice elsewhere in the Corps, elsewhere in the federal government, and within the general economics profession. Most immediately, it deviates from the common practice of the Corps. Since 1983, economic analyses by the Corps of Engineers have generally been guided by a document entitled *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.*[1] Together

[1] U.S. Water Resources Council. 1983. *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.* March 10.

with implementation manuals developed by the Corps, the *Principles and Guidelines* defines the economic components of the public interest with respect to the decisions of federal agencies regarding the management of the nation's waters and lands:[2]

> "The federal objective of water and related land resources planning is to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements." (p. 1)

The *Principles and Guidelines* also defines the primary evaluative criterion for deciding if a federal decision regarding the management of the nation's waters and lands are in the public interest:

> "Four accounts are established to facilitate evaluation and display of effects of alternative plans. The national economic development account is required. ... The national economic development (NED) account displays changes in the economic value of the national output of goods and services." (p. v.)[3]

> "The NED account is the only required account. The NED account describes that part of the NEPA environment, as defined in 40 CFR 1508.14, that identifies beneficial and adverse effects on the economy." (p. 8)

To complete a reasonably accurate NED account, the Corps must provide a full accounting of costs and benefits stemming from the Project, including those that would accrue to parties other than the Project Sponsor. This obligation is recognized clearly in the Corps' manual governing NED analyses.

> "Many economic activities provide incidental benefits to people for whom they were not intended. Other activities indiscriminately impose incidental costs on others. These effects are called externalities. ... **Negative externalities** make someone worse off without that person being compensated for the negative effect. ... *The NED principle requires that externalities be accounted for in order to assure efficient allocation of resources.*"[4]

The *Principles and Guidelines* also requires the Corps not to limit its analysis to goods and services for which there are market prices. Where market prices

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[2] The scope of the applicability of the Principles and Guidelines is expressed in this statement: "These Guidelines establish standards and procedures for use by Federal agencies in formulating and evaluating alternatives plans for water and land resources implementation studies." (p. 1)

[3] The *Principles and Guidelines* clearly distinguishes the NED criterion from other effects, which are addressed in three other analytical accounts: impacts on jobs, incomes, and the revenues of local governments; nonmonetary measures of changes in environmental quality; and other social effects.

[4] U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. 1991. *National Economic Development Procedures Manual: Overview Manual for Conducting National Economic Development Analysis.* IWR Report 91-R-11. October. pp. 21-23 (bold emphasis in original, italics emphasis added). A copy of this agency guidance document is available in the record at Corps AR Doc. 305 (C17684 - C17773) at C17713 – C17715.

do not reflect the full value of a resource to society, then the Corps must estimate this value using appropriate non-price data and methods.[5]

Furthermore, under the analytical standards set by the *Principles and Guidelines* the Corps has an obligation to give a full accounting of the Project's economic risks and uncertainties. As one analyst, in a report to the Corps observed, "Risk analysis is encouraged by regulation and guidance as a 'way of doing business' within the Corps ."[6] The accounting for risks and uncertainties should be broad, rather than narrow, in accordance with the guidance expressed by the agency's own manual on the analysis of risk and uncertainty: "It is the analyst's job to identify, clarify, and quantify areas of risk and uncertainty *wherever possible*, especially for those pieces of information which have a substantial influence on either the choice of an alternative and/or its size and cost."[7]

The *Principles and Guidelines* also define specific analytical procedures. Among them is the requirement for conducting an economic analysis by looking to the future. The Corps should forecast future economic conditions under two scenarios: one with a proposed action and one without it. The forecast of conditions without the proposed action is called the baseline:

> "The forecasts of with- and without-plan conditions should use the inventory of existing conditions as the baseline, and should be based on consideration of the following (including direct, indirect, and cumulative effects)." (p. 4)

The Draft EIS/EIR does not comply with the *Principles and Guidelines*. It does not analyze the Project using the NED account, nor does it look at the Project's impacts on the national economy. It does not analyze the project's externalities, nor does it analyze the Project's impacts on the value of goods and services, such as recreational opportunities, aesthetics, and birds, that do not have market prices. It does not look to the future using a with-vs.-without analytical framework. That is, it does not forecast the baseline values of future goods and services that would exist in the national economy absent the Project, compare this against a forecast of the values that would exist with the Project, and measure the difference between the two scenarios. It does not account for risks and uncertainties associated with the Project.

The Draft EIS/EIR also does not comply with analytical standards established by others. For example, it deviates widely from standards established by the Environmental Protection Agency and by a recent report of

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[5] "If market prices reflect the full economic value of a resource to society, they are to be used to determine NED costs. If market prices do not reflect these values, then an estimate of the other direct costs should be included in the NED costs." *Principles and Guidelines*, p. 10.

[6] Males, R.M. 2002. *Beyond Expected Value: Making Decisions Under Risk and Uncertainty.* Submitted to U.S. Army Corps of Engineers, Institute for Water Resources. September. p. ix.

[7] U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. 1991. *Guidelines for Risk and Uncertainty Analysis in Water Resources Planning.* IWR Report 92-R-1. October, p. 17 (italics emphasis added). A copy of this agency guidance document is included in the record at Corps AR Doc. 305 (C17774 - C17943) at C17798).

the National Research Council.[8] These standards make it clear that, to assess the economic effects of decisions with significant consequences for an ecosystem, the Corps must consider the full set of economic consequences associated with the Project's impacts on the ecosystem, shown in Table 3. This analytical framework requires that the Corps consider the Project's impacts on direct use values, such as the value of the electricity generated, plus the indirect-use values, such as the value of recreation, plus the non-use values, such as the bequest value some place on passing Nantucket Sound to the next generation in an unindustrialized status.

Table 3. Classification and Examples of Total Economic Values for Aquatic[a] Ecosystem Services

Use Values		Nonuse Values
Direct	**Indirect**	**Existence and Bequest Values**
Commercial and recreational fishing	Nutrient retention and cycling	Cultural heritage
Aquaculture	Flood control	Resources for future generations
Transportation	Storm protection	Existence of charismatic species
Wild resources	Habitat function	Existence of wild places
Potable water	Shoreline and river bank stabilization	
Recreation		
Genetic material		
Scientific and educational opportunities		

Source: National Research Council. 2004. *Valuing Ecosystem Services: Toward Better Environmental Decision-Making.*

[a] Freshwater and marine.

B. FAILURE TO CONSIDER ALL RELEVANT FACTORS

Because the Corps failed to provide an appropriate framework for analyzing the Project's economic effects, the economic elements of the Draft EIS/EIR

[8] U.S. Environmental Protection Agency. 2000. *Guidelines for Preparing Economic Analyses.* September; and National Research Council, Committee on Assessing and Valuing the Services of Aquatic and Related Terrestrial Ecosystems. 2004. *Valuing Ecosystem Resources: Toward Better Environmental Decision-Making.* National Academies Press.

wander aimlessly, ignoring many relevant factors. In the end, the economic analysis never produces analytical results one can use to conclude, with reasonable certainty, that the Project's economic benefits will exceed its costs.

Nowhere in the Draft EIS/EIR does the Corps consider, let alone comply with, the analytical standards established by the Corps, itself, or by the EPA and the National Research Council's recent report. Instead, it provides a motley assortment of incomplete information, mixing together monetary values and jobs; evaluating alternative sites primarily in terms of the implications for the Project Sponsor's economic viability; and never providing a coherent assessment of the Project's economic effects on the public interest.

Nowhere does the Corps consider the public interest, defined in terms of the Project's effects on the national output of goods and services, and describe appropriate standards, evaluative criteria, and analytical methods for measuring these effects.[9]

Nowhere does the Corps consider and measure the value of the Project's negative externalities, including costs related to non-market goods and services, using all relevant information and facts. Indeed, the economic sections of the Draft EIS/EIR do not include the term, "non-market" at all, and they include the term, "externalities" only once (p. 5-275), in a reference to a European study that examined the externalities of a wind farm in Denmark. The Corps overlooked evidence contrary to the Project Sponsor's position, that there are no significant negative externalities or negative impacts on non-market goods and services.

Nowhere does the Corps analyze the economic values of the Project's effects on the ecosystem of Nantucket Sound. For example, it never estimates:

- The value of the publicly-owned seabed that the Project would occupy.
- The value of birds that would be killed by the 130 turbines.
- The value of the ecological damage that could result if the turbines were to spill oil into Nantucket Sound.
- The reduction in the intrinsic values" what economists call existence and bequest values" of the Nantucket Sound ecosystem that might result from the Project.

Nowhere does the Corps take a realistic look into the future and consider how the Project's benefits and costs might change relative to one another. In particular, it does not consider the future value of the Project's electricity, for

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[9] The Draft EIS/EIR does have a section labeled "5.16.4.4.4 Economic Benefits at the National Level" (p. 5-274). This section consists of a single paragraph that reports an assessment by the U.S. Department of Energy that is at odds with common principles of economic analysis. For example, it is standard practice when analyzing the benefits and costs of a project, such as this one, to consider the initial capital investment as a cost intended to increase the subsequent output of goods and services, which are considered benefits. The DOE, however, turns this reasoning on its head and counts the Project Sponsor's initial investment, about $500 million, as a benefit, not a cost. It also assumes that the Project would occur during "a slow economic period" implying that, absent the Project, there would be no other opportunity for investing the $500 million. This assumption contradicts standard analytical practice, as reflected (p. 5) in the *Principles and Guidelines*: "National projections used in planning are to be based on a full employment economy." It also is inconsistent with current economic conditions, as reported (p. 5-262) by the Corps: "The NSA unemployment rate in the Islands Workforce Area in June 2003 was 3.7% well below the Massachusetts and US NSA unemployment rates of 5.7% and 6.5%."

which there probably will be substitutes, relative to the future value of other goods and services, for which there probably will be no substitutes. For example, it has not considered the growth in:

- The future value of the aesthetics associated with a non-industrialized Nantucket Sound.
- The future value of seafood.
- The existence and bequest value of the ecosystem that includes Nantucket Sound.

Nowhere does the Corps consider and quantify, consistent with professional standards, the economic costs that could materialize if things go wrong. For example, it never estimates:

- The economic consequences if the Project Sponsor should go bankrupt.
- The value of the reduction in the output of the commercial fishing industry if, contrary to the Corps' assumption, the 130 wind-turbine structures impede fishing activities.
- The economic consequences if the 130 wind-turbine generators should experience systemic technological failure, as has occurred with wind-turbine generators elsewhere, for example, at Horns Rev, in Denmark.
- The economic consequences if the Project should cause or contribute to an accident involving one or more recreational boats, commercial fishing boats, and/or larger vessels.
- The value of the economic harm that would materialize if the Project's impacts on recreation, tourism, and property values in the area should prove significantly more negative than the Corps has assumed.
- The value of the economic harm that would materialize if the risk that the Project would have negative ecological impacts, such as bird kills, than the Corps has assumed.

IV. DEFICIENCIES IN THE CORPS' ANALYSIS OF THE PROJECT'S ECONOMIC BENEFITS

Table 4 lists deficiencies in the Corps' analysis of the Project's potential economic benefits. Three of these potential benefits stem from the anticipated operation of the Project's wind-turbine generators: the Corps anticipates the generators would produce electricity, displacing electricity that otherwise would have been produced by fuel-burning generators at a higher price for consumers. The Corps also anticipates that its impacts on fuel-burning generators would result in lower regional emissions of pollutants harmful to human health and of carbon dioxide, a greenhouse gas. The fourth potential benefit relates to potential increases in jobs, incomes, and taxes.

Table 4. Summary of Deficiencies in the Corps' Analysis of Potential Economic Benefits

Component of Analysis	Deficiency
Value of electricity	Analysis is based on unsubstantiated assumptions
Value of human-health impacts if the Project displaces fuel-burning generators	Analysis is based on unsubstantiated assumptions
Value of forgone carbon emissions if the Project displaces fuel-burning generators	Analysis is based on unsubstantiated assumptions
Positive impacts on jobs, earnings, taxes	Analysis fails to account for offsetting negative impacts

The Corps' analysis of these benefits, however, is deficient and does not provide a reliable description of the benefits that, with reasonable certainty, would materialize if and only if the Project were implemented. Instead, it looks at goods and services that would exist if the Project were implemented and attributes these to the Project, without first determining if they also would exist if the Project were not implemented. Our review indicates it is reasonable to assume that most of these goods and services would exist, with or without the Project, and, hence, it is incorrect to classify their value as the Project's benefits. Our review also indicates the Project probably would have adverse impacts that the Corps overlooked.

We first describe the deficiencies in the Corps' analysis of the potential benefits related to the Project's production of electricity and its impacts on the regional electricity system. We then describe the deficiencies in its analysis of jobs and similar, potential benefits.

A. DEFICIENCIES IN THE ANALYSIS OF ELECTRICITY-RELATED BENEFITS

To measure the Project's impacts on the electricity system, the Corps relies on a study prepared for the Project Sponsor by a consulting firm, La Capra Associates (La Capra).[10] The La Capra study reached these conclusions:

> "La Capra believes that the Cape Wind Project will:
>
> 1) Reduce market clearing prices, resulting in savings to the market on the order of $25 million annually;
> 2) Displace emissions from approximately one percent of present NEPOOL fossil fuel generation;
> 3) Improve reliability of the regional electricity system by increasing the total electricity supply;
> 4) Help meet requirements for significant new renewable generation in New England, particularly in Massachusetts and Connecticut; and
> 5) Diversify the region's electricity mix in terms of fuel supply and generating technology." (p. 1)

Underlying these conclusions lie several, important assumptions that, on inspection, are seen to be unsubstantiated and unreasonable. First and foremost, the Corps assumes the Project would displace electricity that otherwise would be generated by burning fossil fuels.

> "Energy produced by the Cape Wind Project will displace an equivalent amount of energy from the next available, more expensive fossil fuel fired unit(s) ..." (p. 5-267)

In other words, the Corps assumes that, without the Project, fossil-fuel-burning generators would generate electricity but, with the Project, they would not. Based on this assumption, the Corps attribute to the Project the set of economic benefits identified by La Capra: savings of $25 million per year for electricity consumers; reduced emissions; improved reliability of the electricity system; help meeting the renewable-generation requirements of Massachusetts and Connecticut; and diversification of the region's mix of electricity generators.

The Corps, however, did not go far enough in its investigation of this assumption. It did not look to see if these same benefits, more or less, would exist even if the Project were not implemented. If they would, then the Corps erred in attributing these benefits to the Project. Moreover, rather than displacing electricity from generators burning fossil fuels, the Project would displace electricity from other, renewable sources.

To reach its conclusion that the Project would displace electricity from fossil-fuel-burning generators the Corps (relying on La Capra's study) simulated the operation of the regional electricity markets and assumed the electricity generated by the Project would compete openly in these markets.[11] In reality,

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[10] Cory, K.S. and D.C. Smith. 2003. "La Capra Analysis of Cape Wind Project. Memorandum to Mitchell Jacobs and Craig Olmstead, Cape Wind Associates/EMI, January 10. (Appendix 5.16-B of Draft EIS/EIR).

[11] It is not apparent, however, that the Corps (and La Capra) fully considered the Project's overall impact. A recent review of the performance of wind farms in the U.K. found that the impact has been less favorable than

however, electricity from the Project would not compete in the overall, open market, but in a niche, submarket market created by Massachusetts.

Under the state's Renewable Portfolio Standards (RPS), a fixed portion of electricity sold within Massachusetts must come from renewable sources, such as wind, biomass, or the gas from landfills.[12] This requirement creates a niche market for renewably-generated electricity. The niche market is somewhat distinct from the overall electricity market in that only renewable energy sources can be used to meet this requirement. Also, the pricing of electricity generated within this niche market is different from the pricing of electricity generated outside it, insofar producers within the niche can negotiate different terms with retail suppliers of electricity required to have a specific percentage of electricity generated from within the niche.

Since the share of renewable energy is mandated by law, the Corps' analysis should have evaluated the Project's economic benefits looking at its impacts on the niche market rather than its impacts in the larger overall market. In this context, the appropriate question is not, What electricity generator would the Project displace in the overall, open market? but What electricity generator would the Project displace in the renewable-energy market niche?

The analysis by La Capra Associate describes the niche market for renewably-generated electricity created by the region's RPS and notes the Project's probable participation in this market:

> "The renewable attributes of the Cape Wind project are needed to satisfy the requirements for renewable attributes in New England. Massachusetts and Connecticut have renewable portfolio standards ... requiring parties supplying retail load in each state to purchase a percentage of that load from new renewable suppliers. Wind is an eligible 'new' renewable technology in both states." (p. 5)

The La Capra analysis also indicates that the predicted supply of electricity from renewable energy sources (including the Project) is significantly less than that required by the RPS mandate:

> "We estimate that in order to meet the Massachusetts requirement energy production of at least 1,394 GWh per year will be needed from qualifying new renewable facilities by 2006, and about 2,386 GWh per year will be needed by 2009. These energy requirements translate to all-hours, average new renewable production of about 159 MW in 2006 and about 272 MW in 2009. At present, the amount of qualified, new renewable energy project in operation or in construction is clearly insufficient to meet this requirement." (p. 5)

In another analysis that focuses solely on describing the niche market, however, La Capra Associates provided information that contradicts these statements.[13] Information in this other study supports the conclusion that, if

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anticipated, as the unpredictable nature of wind requires that wind farms be backed-up by inefficient operation of coal-burning generators. The result is that the total cost of a dependable supply of electricity is higher than with other alternatives. Royal Academy of Engineering. 2004. *The Cost of Generating Electricity*. March.

[12] Connecticut also has established Renewable Portfolio Standards, and other states in the region are considering similar actions. To facilitate the discussion, we focus on Massachusetts.

[13] Smith, D.C., K.S. Cory, and R.C. Grace. 2000. *Massachusetts Renewable Portfolio Standard: Cost Analysis Report*". La Capra Associates for the Massachusetts Division of Energy Resources. December 21.

it were implemented, the Project would displace electricity from renewable energy, within the niche market, rather than electricity from fossil fuels in the larger, overall electricity market. In its study of the niche market in New England for electricity generated from renewable sources of energy, La Capra found that:

> "We constructed high and low supply scenarios for existing renewables based on alternative assumptions regarding the retirement of exiting renewable plants in New England, and potential renewable imports from neighboring regions. ... Based on our analysis, the supply of existing renewables exceeds the demand throughout the horizon in the high supply [scenario] and for about ten years in the low supply [scenario]." (p. 8)
>
> "[I]t appears that sufficient new renewables will be available to retail suppliers for meeting PRS obligations, provided that suppliers promptly commit to purchases with sufficient lead-time for development and construction to occur ...." (p. 13)
>
> "[W]ith respect to existing renewables ... the projected supply of existing renewable generation in New England and its neighbors (New York, Quebec, and New Brunswick) greatly exceeds potential demand in New England and New York." (p. 15)

The La Capra study also predicted that generation from land-fill gas and biomass would be developed before generation from wind, because of lower costs and shorter development times. It predicted (p. 31) that electricity from wind would not be available until 2006, and that wind's share of total production from renewable sources in the niche market would range from 23.9 percent in 2006 to 31.2 percent in 2012. Furthermore, it predicted (p. 23) that electricity from wind initially would come from generators in New York and Quebec, rather from within the New England states, where the barriers to development would be higher.

Taken together, this information indicates that the Project's greatest impact on the electricity system probably would not be to displace electricity from a fossil-fuel-burning generator but to displace electricity derived from one or more, alternative renewable sources. It might displace electricity from another wind generator, perhaps, or from generators fueled by land-fill gas or biomass.

Here's the same conclusion, stated differently: by adopting its RPS, Massachusetts has ensured that electricity from renewable sources of energy will have a niche in the electricity system and displace electricity from fossil-fuels. If the La Capra study of the niche market is correct, there is no shortage of options for filling the niche. If the Project does not fill part of the niche some other renewable source(s) of electricity will do so. Hence, if the Project were to elbow in, it would displace some other renewable source of electricity. This displaced renewable source of electricity might have costs that are higher or lower than the Project's. It is impossible to tell from the La Capra studies or the Corps' analysis. If the Project were to displace electricity from a renewable source with lower costs, then, rather than increasing the net value of the electricity in the niche market, it would decrease the value.

If the Project were to displace another, renewable source of electricity rather than electricity derived from fossil fuels, then the Corps' estimates regarding all of the Project's electricity-related benefits are way off-target. The Project would not yield "savings to the market on the order of $25 million annually." Instead, it might yield no savings at all or it might even increase consumers'

costs. If the Project were to displace another, renewable source of electricity rather than electricity derived from fossil fuels, then the Project would not yield the emissions-related benefits for reductions in emissions harmful to human health or for reductions in emissions of greenhouse gases reported by the Corps.

The Corps analysis does not investigate the niche, renewable-energy market created by RPS mandates, the Project's competitive position in this niche market, or the net benefits (or net costs) that would result from the Project's economic impacts on other competitors in this niche market.[14] The Corps also does not consider the possibility that, even if the Project were to displace electricity from a fossil-fuel-burning generator, the human-health benefits might not materialize on a national level. This outcome seems likely, insofar as cap-and-trade programs for SO2 and NOx would allow any reduction in emissions resulting from the Project to be offset by increased emissions elsewhere, until total regional and national emissions are at the maximum allowed by each cap.

The Draft EIS/EIR discussed none of these issues. Instead, the Corps analysis assumed the project would compete in the region's overall, electricity market rather than in a niche market for renewable energy. Even if this assumption were correct, evidence indicates the Corps overstated the amount of pollution that the Project would displace, insofar as it also assumed production from the Project would displace electricity from the dirtiest power plants in New England, Salem Harbor or Brayton Point, with emissions at past levels. Analysis by the Beacon Hill Institute, however, indicates that, if the project competed in the overall electricity market, its production would displace electricity from other plants with much lower emission rates.[15] The specific facility (or facilities) that would be displaced must still be determined, but the analysis by the Beacon Hill Institute indicates that, if the Project were to displace the "marginal producer in the grid" rather than Salem Harbor or Brayton Point, then adjusting the Corps' analysis to reflect this shift would lower the Project's health-related benefits from $53 million to $7 million per year.[16]

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[14] Other issues arise when one looks beyond the niche market. If the Corps should determine that the Project would not compete in the niche market created by Massachusetts, then among its competitors in the overall market are conservation measures, which might provide more efficient pathways for meeting electricity demand in the region and accomplishing environmental objectives. If conservation proved more efficient, then allocating federal lands and waters to the Project would not to be in the public interests of all Americans.

[15] Haughton, J. 2004. *Economic Costs Exceed Economic Benefits for the Cape Wind Project.* December 16, and Guiffre, D. 2004. *Public Health Impacts and Economic Costs from Power Plant Emissions.* December 7.

[16] Guiffre, D. 2004. *Public Health Impacts and Economic Costs from Power Plant Emissions.* December 7. p. 4.

B. DEFICIENCIES IN THE ANALYSIS OF JOBS AND RELATED BENEFITS

To measure the Project's impacts on jobs and other, related variables, the Corps relies on a study completed by Global Insight, a consulting firm working for the Project Sponsor.[17] The Global Insight study generally found that the Project would have positive impacts, including these:

- During the manufacturing/assembly and construction/installation phases of the Project, jobs would increase (597-1,013); economic output would increase ($85-$137 million); labor income would increase ($32-$52 million); revenues from the personal income tax would increase ($4.8-$7.8 million); and revenues from corporate income tax would increase ($1.3-$2.1 million).
- During the operation phase of the Project, jobs would increase (154); economic output would increase ($22 million); wholesale power costs would fall ($25 million per year); state tax revenues would increase ($460,400); and revenues for Yarmouth and Barnstable would increase ($279,700).

These numbers are misleading, however, because the underlying analysis suffers from the same discrepancies present in the Corps' analysis of electricity-related benefits. Global Insight's and, hence, the Corps' look at the jobs, incomes, taxes, economic output, etc., that would exist if the Project were implemented and conclude that the Project is the unique cause. They do not determine if the same levels of jobs, incomes, taxes, economic output, etc. also would exist if the Project were not implemented. In procedural terms, the Corps did not conduct a with-vs.-without analysis that isolates the unique economic consequences attributable to the project.

To correct this deficiency, the Corps must develop two forecasts, not just one, of jobs, incomes, taxes, economic output, etc. One forecast must predict what the future levels of these variables would be without the Project. The other must repeat the exercise assuming that the Project would be implemented. The impact of the Project would equal the difference between the two forecasts.

If the Corps were to conduct the analysis following this standard analytical approach, it probably would markedly reduce its estimates of the Project's impacts on jobs and the other variables. That is, it probably would conclude that the levels of jobs, etc. in the without-Project scenario closely resemble the levels in the with-Project scenario. In the Corps' current analysis, the jobs, etc. would materialize from the Project Sponsor's investment to construct the Project, its expenditures to operate it, and the savings consumers would realize from its impacts, as described by La Capra Associates, on the retail price of electricity. As we explain above, however, absent the Project, other groups would invest in, construct, and operate other plants to generate electricity from renewable energy sources. These other plants would yield levels of jobs, incomes, economic output, taxes, etc., more or less the same as those associated with the Project. The spatial distribution

[17] Global Insight. 2003. *Impact Analysis of the Cape Wind Off-Shore Renewable Energy Project on Local, State, and Regional Economies*. Cape Wind Associates. September 26. (Appendix 5.16-A of Draft EIS/EIR).

of effects would be different, insofar as the Project's effects on jobs, etc. would occur near Nantucket Sound whereas the direct effects from other plants would be concentrated elsewhere. For the region as a whole, however, the net effect of the Project on jobs, incomes, economic output, taxes, and related variables would be near zero.

V. DEFICIENCIES IN THE CORPS' ANALYSIS OF THE PROJECT'S DIRECT ECONOMIC COSTS

Table 5 lists three deficiencies in the Corps' analysis of the costs that would or should be borne directly by the Project Sponsor. The first of these is the Corps' failure to consider the value of the lands and waters that the project would occupy. The second is the Corps' incomplete analysis of the costs of decommissioning the Project. The third is the Corps' failure to consider costs the Project Sponsor might incur if the Project experienced a serious technological failure or extraordinary accident.

Table 5. Summary of Deficiencies in the Corps' Analysis of Direct Economic Costs

Component of Analysis	Deficiency
Value of seabed, waters, and on-shore right-of-way occupied by the Project	Missing
Decommissioning costs	Analysis based on unsubstantiated assumptions
Costs (to Project Sponsor) of serious technological failure or extraordinary accidents	Missing

A. COSTS ASSOCIATED WITH LANDS AND WATERS THE PROJECT WOULD OCCUPY

The Corps' analysis in the Draft EIS/EIR does not calculate the value of a major element of the Project's costs: the publicly-owned resources that the Project would occupy. These resources include the federal seabed and waters that would be occupied by the wind-turbine generators and related facilities, as well as the federal, state, and local land that would be occupied by the transmission cable.

The Corps did not measure the values of these resources. Hence, it has not evaluated the Project's full costs. Moreover, it has not estimated the payments the Project sponsor might pay to lease these resources' federal, state, and local' and how these payments would affect the Project's financial feasibility.[18]

[18]Note that the fees the Project Sponsor might pay to lease the resources are not necessarily the same as the full value of the resources, given long history of governments leasing their resources for less than the true value. See for example, National Oceanic and Atmospheric Administration. National Ocean Service. National Marine Sanctuary Program. 2002. *Final Report: Fair Market Value Analysis For A Fiber Optic Cable Permit In National*

In measuring the value of the occupied lands and waters, the Corps should consider the full set of factors that can influence the value. These include the forgone value to of alternative uses of these resources, recognizing not just the forgone value of current and foreseeable alternatives but also the forgone option value associated with the possibility that, by leasing the resources to the Project Sponsor, each government would forgo uses that are not now foreseeable. The Corps also should consider each governmentÕs costs associated with leasing the resources to the Project Sponsor, and the value of economic risks that leasing lands and waters to the Project Sponsor would generate for the government.

Recognizing that lands, waters, and other resources have value, federal policy requires that users pay fees to consume or occupy federal resources.[19] Charging a fee helps ensure that resources will be used efficiently, that is, that they wonÕt be misused or wasted. Furthermore, the closer the fee approximates the full value of the goods and services that are forgone when a resource is allocated to one use rather than to the best, alternative use, the more likely the resources will be used in an economically efficient manner.[20] In settings where markets fully measure the tradeoffs among alternative uses of a resource, then the most efficient fee for leasing a government-owned resource would equal its market price. In reality, however, markets generally do not measure all dimensions of the tradeoffs associated with the use of government-owned resources and the fees governments charge for using their resources typically underestimate the resourcesÕ full value.

There is no uniform policy regarding fees applicable to wind farms. The U.S. Commission on Ocean Policy, however, has recommended that offshore energy projects pay fair market value to occupy the seabed.[21] The Minerals Management Service manages leasing of offshore federal lands for the extraction of oil and gas, but currently has no provisions for leasing offshore lands for the production of wind-powered electricity. Oil and gas developers typically pay three types of fees to use federal, offshore lands: a one-time lease fee established by competitive bid; an annual rental fee during the development stage; and an annual royalty fee on production. The Minerals Management Service sets a minimum bid for leases at $25 per acre for water depths of less than 800 meters. Established rental rates are $5 per acre pre year for water depths of less than 200 meters. Royalty rates for production in water depths of less than 400 meters are 16-2/3 percent of the market value

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Marine Sanctuaries. August, for information on the differences that existed historically between lease payments for rights-of-way across federal and private lands.

[19] U.S. Office of Management and Budget. 1993 (and later revisions). *Circular No. A-25*. www.whitehouse.gov/omb/circulars/a025/a025.html. Accessed on January 13, 2005.

[20] Economists often use the term, opportunity cost, to refer to the costs realized by allocating resources to one use rather than to the alternative with the highest net benefits.

[21] U.S. Commission on Ocean Policy. 2004. *An Ocean Blueprint for the 21st Century*. July 22. www.oceancommission.gov. Accessed January 4, 2005.

of production.[22] There are no current oil or gas leases on federal lands in the Atlantic.

For wind farms on its lands, the U.S. Bureau of Land Management (BLM) applies an "Interim Wind Energy Development Policy," which requires that the developers of wind-powered generators on its lands pay a minimum lease fee during development, and a production rent" calculated based on a percentage of the market rate for electricity" when the wind farm generates electricity for sale.[23] So far, the agency has applied only the minimum fee provided for by the interim policy, $2,365 per year, per megawatt (MW) of capacity.

To assist the Corps in measuring the value of the seabed and waters occupied by the wind farm and transmission cable, we offer the following:

- If the Project Sponsor paid the minimum lease fee applicable in the past to oil and gas development on federal offshore lands , $25 per acre, the payments for the 24 square miles occupied by the Project would total $384,000.[24]
- If the Project Sponsor paid the established rental rate of $5 per acre, the payments would total $76,800 per year, for each year of development.
- If the Project Sponsor paid the established royalty fee applicable in the past to oil and gas development on federal offshore lands, 16-2/3 percent of the value of production, the payments would total about $8.4 million per year.[25]
- If the Project Sponsor paid BLM's minimum lease fee of $2,365 per megawatt to occupy the federal seabed, the lease payments for the wind farm's proposed 454 megawatts would be $1,073,710 per year[26].
- Wind-turbine generators on private lands typically pay lease fees to landowners. One study found these fees range from $1,500 to $2,000

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[22] Personal Communication. Jane Johnson, Minerals Management Service, New Orleans District Office, 504-736-2811, February 1, 2005; Minerals Management Service, *Final Notice of Sale 184*, www.gomr.mms.gov/homepg/lsesale/184noticef.html Accessed February 1, 2005.

[23] U.S. Department of the Interior, Bureau of Land Management (BLM). 2002. *Instruction Memorandum No. 2003-020, Interim Wind Energy Development Policy, Right-of-Way Management, Wind Energy.* October 16. www.blm.gov/nhp/efoia/wo/fy03/im2003-020.htm. Accessed on January 4, 2005.

[24] An oil and gas developer typically pays a lease fee for the entire tract it develops, not just for the site occupied by a drilling rig. We assume the Project Sponsor would pay a single lease fee for the entire tract, 24 square miles, rather than 130 separate lease fees, one for each of the wind-turbine generators.

[25] La Capra Associates (Appendix 5.16-B, p. 2) estimates the Project would have a capacity of 468 MW and produce 1,486 GWh of annual production. For this illustrative calculation we scaled the production down, reflecting the Corps's statement that the Project would have a capacity of 454 MW (Draft EIS/EIR, p. 1-3), and we assumed output from the Project would be priced at $0.035 per kWh.

[26] U.S. Department of the Interior, BLM. 2002. Page 5; and, Personal Communication. January 4, 2005. BLM Palm Springs, CA office, Claude Kirby, 760-251-4850. The BLM currently charges only the minimum lease fee allowed and has not yet implemented provisions allowing it to charge higher fees.

per turbine, per year.[27] If this range were to apply in this case, the Project Sponsor would pay annual lease payments for just the 130 generators (not the transmission cable or ancillary facilities) of $195,000 – $260,000.

- Developers of offshore wind-powered generators in the U.K. pay a lease fee equal to 2 percent of the total costs.[28] If this rate were applied to the Project, the present value of its lease fees would be about $16 million.

In principle, the Project Sponsor also should pay a lease fee for federal, state, and local lands occupied by its transmission cable. The Project sponsor has agreed to pay the town of Yarmouth a one-time payment of $150,000 and annual payments of $350,000 for use of its right of way.[29] We are not aware of any agreement to pay fees for the use of state or federal lands.[30]

The lease fees described above provide data the Corps can use to estimate the potential lease fees the project sponsor might pay for the right to occupy federal, state, and local lands. All else equal, additional fees would be required for the Project's occupation of federal and state waters. It is important to recognize that data on lease fees underestimate the full value of occupying public resources because they do not include the value of affected goods and services that are not, or cannot be, exchanged in the marketplace[31]. In this case, the affected non-market goods and services may include the existence and bequest values of the ocean water and seabed. See Section VI. D. for our discussion of non-market values.

B. DECOMMISSIONING COSTS

The Corps has failed to consider all factors that influence the Project's decommissioning costs, i.e., the costs of disassembling the turbines and removing all material from the Project site. The Corps assumes (Table 3-46)

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[27] Northwest Economic Associates, Inc. 2003. *Assessing the Economic Development Impacts of Wind Power.* National Wind Coordinating Committee c/o RESOLVE. February 12.

[28] Department of Trade and Industry, Strategic Energy Environmental Assessment (U.K.). "Wind Background: Cost of Wind Power Generation" http://www.offshore-sea.org.uk/site/scripts/documents_info.php?documentID=6&pageNumber=2

[29] Emery, Theo. 2004. Associated Press. hoasted.ap.org/dynamic/stories/W/WIND_FARM?SITE=WABEL&SECTION=HOME&TEMPLATE=DEFAULT. Accessed on December 28, 2004.

[30] One point of reference regarding the potential magnitude of the fees comes from the Cross Sound Cable Interconnector" a submarine cable that connects the electric transmission grids of New England and Long Island, New York. The owners paid the State of New York $750,000 for a 25-year lease for an easement across New York waters.

[31] National Oceanic and Atmospheric Administration. National Ocean Service. National Marine Sanctuary Program. 2002. *Final Report: Fair Market Value Analysis For A Fiber Optic Cable Permit In National Marine Sanctuaries.* August.

that, if decommissioning were to occur today, it would cost $53 per kW of installed capacity, or $24,873,742 for all 130 generators in the Project.

The foundation for this assumption, however, is not robust. The assumption rests on this statement (p. 3-128): "published references for decommissioning of onshore facilities generally indicate that the decommissioning cost is negligible when the salvage value of the material is considered [two citations]." Therefore, according to this reasoning, the only cost would be the cost particular to decommissioning at an offshore site. Our review of the two documents cited in this statement by the Corps, however, indicates they do not support the Corps assumption that decommissioning costs for onshore generators are negligible. Moreover, our review of other relevant literature found observations from California indicating that the decommissioning cost can exceed salvage value of the materials by $50 per kW, or perhaps more.[32] If the Project should experience similar decommissioning costs, they would be about twice the Corps' estimate, or perhaps more. At $100/kW, for example, the decommissioning costs would be $45,400,000. If these costs were incurred in year 20, the present value would be $11.7 million with a discount rate of 7 percent, or $25.1 million with a discount rate of 3 percent.

Reports from Europe indicate the decommissioning costs would be even higher. An industrial overview, aimed at stimulating development of the wind-energy industry in Europe, stated that the industry expects decommissioning of offshore projects to constitute about 3 percent of a project's total costs.[33] Some researchers, however, have estimated the decommissioning costs to be 11.8 percent of total costs.[34] At these rates, the present value of the Project's decommissioning costs would be about $24 million – $98 million. A separate study of decommissioning costs in the U.K. estimated them to be £118,000 per turbine, or £34,000 per MW.[35] At these rates, the present value of the Project's decommissioning costs would be about $29 million.

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[32] Gipe, P. 1997. "Removal and Restoration Costs in California: Who Will Pay?" http://www.wind-works.org/articles/Removal.html

[33] Garrad Hassan & Partners, Tractebel Energy Engineering, Rise National Laboratory, Kvaerner Oil & Gas, Energi & Miljoe Undersoegelser. 2001. *Offshore Wind Energy: Ready to Power a Sustainable Europe.* December. p. 6-2. http://www.offshore-wind.de/media/article000325/CA-OWEE_Complete.pdf.

[34] Henderson, A., G. Watson, M. Patel, and J. Halliday. [no date] "Floating Offshore Wind Farms – An Option?" http://www.windenergy.citg.tudelft.nl/content/research/pdfs/owemes00a_arh.pdf.

[35] Pearson, D. [no date] "Decommissioning Wind Turbines In The UK Offshore Zone." http://www.owen.eru.rl.ac.uk/documents/BWEA23/BWEA23_Pearson_Decommisioning_paper.pdf.

C. COSTS OF TECHNOLOGICAL FAILURE OR EXTRAORDINARY ACCIDENTS

The final item in Table 5 identifies the Corps failure to include in its economic analysis any consideration of direct costs the Project Sponsor might incur, stemming from potential serious technological failures or experience extraordinary accidents.

Technological failures of wind-turbine generators have occurred elsewhere, on land and offshore. At the world's largest offshore, wind-powered generating plant, located at Horns Rev in Denmark, for example, all 80 turbines had to be repaired and upgraded within one year after their initial operation. The Corps, however, does not explicitly assess the probability of technological failures or their economic consequences. The Corps treatment of this issue contrasts with the statements of its peer-review committee, which highlighted the importance of accounting for technological failures.[36] In its comments on the Project's long-term viability, for example, the committee stated:

> "Emphasis here should be on the long-term risks and unknowns. The worst possible environmental outcome would be a failed and derelict project, with the owners in bankruptcy court. This would lead an unattended wind farm exposed to the elements for an extended period of time, with no clear path to alternatively refurbish the project, salvage the remains, or decommission the project. This scenario has previously been played out in the late 1980's in California.
>
> "To address future unknowns, either technical or environmental, the project must have 'long-term viability'. The wind industry has seen a number of unexpected technical problems after several years of initial operation. These include rotor and gearbox failures, higher than expected O&M costs, as well as the need for unplanned environmental studies, such as to further understand avian impacts. It is critical to have a viable project generating the financial resources with access to the technical expertise necessary to address unexpected problems, and to maintain and improve the facility over time." (p. 15)

The Corps similarly failed to analyze the economic consequences of potential accidents involving the Project, even though it acknowledged the existence of precursors for extraordinary accidents. Powerful storms occur frequently; two shipping channels are nearby; recreational boats and commercial fishing boats are likely to move through the Project area; and the area experiences periods with strong tidal currents, reduced visibility, high winds, and high waves. After describing these precursors, however, the Corps did not take the next step and consider plausible accident scenarios and their economic costs.

We discuss accident-related issues in section VI.E.

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[36] Draft EIS/EIR, Appendix 3-E. Peer Review Committee, Offshore Wind Energy, New England Technical Review of Preliminary Screening Criteria for the Cape Wind EIS Consolidated comments on Section 2.0 and 3.0 of the Draft EIS September 30,2003.

VI. DEFICIENCIES IN THE ANALYSIS OF THE COSTS THE PROJECT WOULD IMPOSE ON OTHERS

Table 6 lists deficiencies in the Corps' analysis of costs the Project would impose on others, i.e. the Project's negative externalities. All of them stem from the Corps' failure to account for all the relevant factors regarding the Project's potential, adverse impacts on the ecosystem of Nantucket Sound.

Table 6. Summary of Deficiencies in the Corps' Analysis of Costs the Project Would Impose on Others

Component of Analysis	Deficiency
Value of negative impacts on other uses of the ecosystem: fishing industry	Incomplete analysis based on unsubstantiated assumptions
Value of negative impacts on other uses of the ecosystem: recreation/tourism	Measures the wrong variables
Value of negative impacts on property values	Incomplete analysis based on unsubstantiated assumptions
Value of negative impacts on the non-use values of the ecosystem (including option, bequest, and existence value)	Missing
Jeopardy to state, local, private investments in the ecosystem	Missing

A. COSTS IMPOSED ON THE COMMERCIAL FISHING INDUSTRY

The first item in Table 6 identifies the Corps' failure to consider all relevant factors as it analyzed the Project's impacts on the commercial fishing industry. The Corps concludes that:

> "The Project is not anticipated to have significant impacts on commercial fishing ... since the [Project Sponsor] will not impose any restrictions on fishing within the Wind Park during Project operation. ... Any potential conflicts [during construction] with commercial fishing activity and gear, will be minimized by notifying registered fishermen as to the location and timeframe of Project construction activities .... [T]he physical presence of [the wind-turbine generators] should not interfere with commercial fishing activity, including maneuvering of commercial vessels." (p. 5-279, -280).

This conclusion, however, rests on several unsubstantiated assumptions. First, the Corps assumes the Project would not cause the fishing industry to alter its operations: boats would operate in the area as before, with the same

maneuverability and level of risk. The Corps provides no evidence to substantiate this assumption. Moreover, it ignores contrary evidence, such as its own acknowledgement that the area experiences periods with strong tidal currents, reduced visibility, high winds, and high waves (pp. 5-278, -279). The Corps also observes that structures would pose some risk to boats and that mariners would have to be "more attentive" because of the risks associated with operating a boat in the vicinity of wind-turbine structures (p. 3-25). Nonetheless, the Corps dismissed this evidence and would have us believe that, even when hazardous conditions materialize, the maneuverability of and risk to fishing boats would be the same with the presence of 130 concrete structures as they would be with open waters.

Second, the Corps assumes there is zero probability that the Project would result in restrictions on commercial fishing in the area: the Project Sponsor would never see any risk from having fishing boats in the vicinity of its generators and seek to keep them at a greater distance; and the Coast Guard would never see any hazard and restrict boats from entering the area. Again, the Corps offers no evidence to substantiate its assumption and ignores contrary evidence. For the assumption to be true, either there must be zero risk of accidents from having fishing boats among the structures or, if there were risk, then the Project Sponsor and the Coast Guard must not be risk-averse and would not seek to reduce the risk. Neither of these conditions is supported by facts.

Third, the Corps assumes there would be zero economic costs from "Temporary impacts" on the activities of fishing boats and "minimized" conflicts with fishing activity and gear. Again, this assumption lacks substantiation. It is contradicted by information provided by representatives of the fishing industry. For example, in a letter to the Corps dated October 16, 2004, Capt. William Amaru stated that gear typically used in the area exceeds the proposed distance between the proposed structures, explained that the structures will impede commercial fishing operations, and create risks for boats, operators, and their crews:

> "A trawler tows a series of cables attached to doors which weight and spread the net and keep it on the bottom. The cables are towed behind the boat at a distance of between four and six hundred feet, and the net can be as much as fourteen hundred feet behind the boat. While there is much more to the operation than I can briefly describe, let it be understood that a great deal of space is necessary to safely trawl and maneuver in this fishery. The proposal to place the turbines as close together as described by Wind Associates will place in jepordy [sic] the operators and crews of trawlers. Additionally, boat traffic such as ferries, sail boats, recreational fishers and pleasure boat operators, all of whom share the resource with us, will be placed at greater risk. ...We as a profession have been asked to give up more than any other user group: The loss of this important fishery would be devastating, and unnecessary."

These points were elucidated in a letter, dated October 15, 2004, to the Corps from Wayne Kurker:

> "3) The USACE needs to understand that the gear doesn't stay right in back of the boat. Each boat tows two tow-lines that connect to two trawl doors which spread the gear 300' - 400' apart, that connects to two ground cables which connect to one net The purpose of the doors is to spread the net and keep it on the sea floor. ...

"4) Fishing is a very imperfect science, and primarily the fish are located in pods, so it is not as though each fisherman could get in between one row of turbines and simply fish that row. The fishermen need to locate the fish and concentrate their efforts where the fish are found and they need to turn at the end of each tow.

"5) Fishing is a dynamic undertaking, the boats tow, along every compass heading possible depending on the wind, tide, locations of the fish and of course locations of the other boats.

"6) When the trawler goes to turn, the gear understandably doesn't stay right behind the boat. **Therefore, a boat towing it's trawl gear needs a large turning radius (more than 1/2 mile and up to 1 mile, under unobstructed conditions)** much more than the third and half mile distances between the wind turbines. (bold emphasis in original)

"7) The USACE also cannot assume that there is only one boat working between two towers and naturally this gets much more complicated when you put many boats in the same area. It is not unusual to see a fleet of over 40 boats out there at one time.

"One example of a common difficulty is when a trawl hangs up. The boat has to haul back and the vessel is no longer under the captain's control. It is subject to tide, wind, and the trawler itself now becomes an obstruction. Other boats in the area now must make unplanned turns and maneuvers, endangering the other vessels fishing nearby."

The economic consequences of the risks that would accompany the wind-turbine structures were described in a letter, dated December 6, 2004, to the Corps from the Massachusetts Fishermen's Partnership, an umbrella organization of 17 commercial fishing associations representing all gear and geographic sectors of the Massachusetts fishing industry:

"Among other points, the Army Corps' DEIS characterizes the wind farm as an inconvenience to fishermen; however, according to experienced mobile gear fishermen, the spacing between the wind towers will make mobile fishing gear navigation impossible. This will have direct adverse economic impacts on the fishermen who will thus be displaced from an area that generates up to 60% of their annual income. In addition, indirect negative economic, environmental and safety impacts are likely to result from crowding fishermen who fish other areas in Nantucket Sound. The Army Corps' DEIS ignores the potential adverse impacts to fishermen operating in this productive area."

Related information was provided to the Corps based on meetings with fishermen:[37]

"Serious potential environmental impacts identified by participating representatives of the fishing industry included:

- loss of resources due to habitat disruption, pollution
- large-scale habitat conversion of shoals area due to changes in water flow and sediment transport
- increased bird mortality due to strikes and loss of forage
- loss or alteration of critical squid spawning habitat and/or
- loss of fishing access, particularly to mobile gear.

"This limited study does not purport to have determined the full scope of the potential impacts of the proposed wind farm on the portion of the fishing industry or fishing communities associated with the use of Horseshoe Shoals. Nor can the authors assert how many individual businesses will be affected, either directly or indirectly.

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[37] Hall-Arber, M., D. Bergeron, and R. Ryznar. 2004. Commercial Fishing in Nantucket Sound: Consideration pertinent to the proposed wind farm on Horseshoe Shoals.

Nevertheless, the authors do caution that a number of mobile gear fishing vessels will be displaced if the proposed Cape Wind farm is constructed, and this displacement could have a broader impact throughout the entire Nantucket Sound area."

B. COSTS THE PROJECT WOULD IMPOSE ON RECREATIONISTS AND TOURISTS

The second item in Table 6 identifies the Corps failure to consider all factors when it analyzed the economic costs associated with the Project's potential impacts on recreational and tourism uses of the ecosystem. The Corps concludes:

> "As evidenced by the experiences at other wind farms, the Project will likely have a negligible effect on the use of recreational resources and a positive effect on tourism in general for Cape Cod and the Islands" (p. 5-278).
>
> "Based on studies conducted at wind farms in the United States and in Europe, no adverse impacts on tourism and recreation are expected from the Project." (p. 5-283)

These statements reveal two fundamental deficiencies in the Corps analysis. One of these is the Corps reliance on a selective reading of the relevant literature, considering only reports that found no adverse impacts on tourism and recreation, and overlooking those to the contrary. Prominent within the Corps discussion of the Project's potential impacts on recreation and tourism is this statement (p. 5-276): "Studies conducted on wind farms performed throughout the world have shown that wind farms generally have a positive impact on tourism." To support this statement, the Corps describes a single study, commissioned by a trade association that promotes the industry, the British Wind Energy Association (BWEA), and states that this study "found many examples of wind farms that enhanced tourism, and no examples of wind farms that had a negative impact on local tourism ."

The Corps failed to cite and discuss the findings of contradictory reports. In particular, the Corps failed to recognize the significance of research findings indicating that, although tourists generally are either positive or neutral to past wind farms, some tourists have strong, negative opinions. Indeed, even the study the Corps cited found that not everyone found wind turbines an enhancement to visual aesthetics. Moreover, the Corps has failed to recognize the potential for the negative opinions to be exacerbated by wind farms having features characteristic of the Project: generators larger than those in the past, situated in an area that attracts many tourists because of its undeveloped, visual amenities. For example, the Corps overlooked these reports and their findings:

- In a study conducted for the European Union, researchers surveyed tourists, local residents, and representatives of the tourism industry at sites in Spain and Portugal where offshore, wind-turbine generators have been proposed in areas with a high level of coastal-oriented tourism.[38] The researchers found that 26

[38] Iberdrola and Ecossistema. 2001. "Methodological Guidelines for the Environmental and Socioeconomic Impact Assessment of Off-shore Windfarms in Touristic Areas." Altener Programme. http://www.eia.es/windtour/docs/WINDTOUR.pdf

percent of respondents "were against or strongly against" the proposed projects, and 39 percent said the negative effects would be as large or larger than the positive effects. When identifying their first choice of concern regarding the potential negative effects, the highest scoring responses were "effects on bird life and marine fauna" (47 percent), and "loss of quality of the scenery" (22 percent). Only 1 percent of respondents agreed that an offshore wind farm could "make the scenery more interesting."

- In a summary of the literature, a study of tourists' attitudes toward wind power in Sweden observed that an earlier study (in Swedish) shows "that it is possible to combine tourism and wind power as long as wind power mills are not placed in the areas that are of importance for tourism."[39] (underline emphasis added)

- A progress report on a Danish study to examine the economic value of the visual externalities of off-shore wind farms premised the study with these observations:

  "the turbines that are built now have a much more dominating impact on the surroundings than the turbines built 10 or 20 years ago. The larger the turbines are, the greater are the areas in which people potentially may be bothered by visual or noise externalities generated by the turbines. Combined with the already high density of wind turbines, this implies that it is becoming increasingly difficult to find areas that are both technically and socially acceptable for the placing of new land-based turbines. ...

  "Despite the intuitive appeal of taking wind power production to sea, off-shore wind farm projects have meet [sic] opposition both at the national and at the local level. The motives underlying the opposition may be attitudinal or psychological in character; e.g. it may be motivated by a – perhaps only temporary – opposition to change, a sense of having been left out of the decision process, a desire to express discontent with the underlying energy policy or a strong ecological conviction that the sea should remain untouched. The motives may however also be economic in the sense that the opposition may be caused by a rational concern for the biological and marine environment, actual or expected losses of amenity value due to visual externalities, reduced earnings in the tourist sector and/or declining catches of fish caused by reductions in the area available for fisheries."[40]

- A study of the potential impact of wind farms on tourism in Scotland, commissioned by an arm of Scotland's National Tourism Board produced these findings:

  A survey of visitors to Scotland found that 38 percent of respondents felt that wind farms 'spoiled the scenery' and, although more than three-quarters had "overall views [that] were either positive or neutral towards wind farm development, ...21 percent of visitors held much more negative views toward wind farm development."

  Interviews of "key players" and other representatives of the tourism industry found that, although they recognized the positive attributes of wind farms, they concluded that, because of the negative visual impacts, wind farms

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[39] Lindberg, K, J.M. Denstadli, T. Vuorio, and P. Fredman. 2002. Residents in Sodra Jamtlandsfjallen: Attitudes toward windpower, national park designation, and tourism development. European Tourism Research Institute. http://www.etour.se/download/18.d02ad3f455c7702f7fff1804/WP2002000300002002110546941558av.dat_p.pdf, accessed January 11, 2004.

[40] Dubgaard, A. 2004. *Annual Status Report 2003: Economic Valuation of the Visual Externalities of Off-Shore wind Farms.* KVL: The Royal Veterinary and Agricultural University, Denmark. http://www.hornsrev.dk/Miljoeforhold/miljoerapporter/POST-CONSTRUCTION-Annual%20Report-2003-Economic%20valuation%20of%20the%20visual%20externalities%20of%20off-shore%20wind%20farms.pdf, accessed January 14, 2005.

should be sited outside National Parks, national Reserves, and "those areas which are regarded as key tourist 'honeypot' locations."

- The Swedish Commission on Wind Power has concluded: "The best wind conditions often exist in areas of considerable natural beauty and scientific and cultural interest, e.g. along the coasts and in the mountain region. Wind power stations directly utilise only small areas. Sound emissions and shadow effects, however, entail disturbances over wider areas and greatly restrict localisation options, e.g. out of consideration for settlement and recreation. Wind power stations impact on the landscape at great distances, due to their height and also because they are tending more and more to be built in groups. Studies by the Commission have shown that many people find this the most troublesome effect on the surroundings."[41]

In sum, many studies have findings contrary to the Corps' statement that the literature supports its conclusion that "no adverse impacts on tourism and recreation are expected from the Project." The Corps either was unaware of these studies when it prepared the Draft EIS/EIR, or it knew of but disregarded them. Either way, its failure to consider the full set of relevant literature undermines its economic analysis. Until it corrects this deficiency, one cannot have confidence in its findings regarding the Project's potential impacts on recreation and tourism.

Another fundamental deficiency in its analysis of the Project's recreational and tourism impacts is the Corps' total failure to consider, let alone measure, the economic value of these impacts. As we explain below, evidence indicates the Project would reduce the value of recreational and tourism assets and activities in the area. This reduction would constitute a significant economic cost that the Corps must consider if it is to describe the Project's overall impacts on the value of nation's output of goods and services.

Central to the analysis of this aspect of the analysis is the economists' concept known as consumers' surplus. Consumer's surplus in this context is the difference between the total value a recreationist or tourist places on sightseeing, boating and other resource-related activities, and the cost s/he incurs to engage in the activities.[42] Recreationists and tourists in this area would incur an economic cost if, all else equal, they suffered a reduction, because of the Project, in the consumer's surplus they derive from the resources of Nantucket Sound.

The Corps's discussion of the project's impacts on socioeconomic (Section 5.16) makes no mention of the Project's impact on consumer's surplus in any context, including the recreational and tourism impacts. Instead, it focuses on the numbers of recreationists and tourists; asserts that the Project would not affect the number of recreationists and would increase the number of tourists, and concludes that no further analysis was needed.

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[41] "The Right Place for Wind Power." http://www.svensk-vindkraft.org/WindPowerReportSOU1999-75SummaryJune99.htm, accessed January 14, 2005.

[42] U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. 1991. *National Economic Development Procedures Manual: Overview Manual for Conducting National Economic Development Analysis*. IWR Report 91-R-11. October.

These dots don't connect, however. The Corps has not examined the possibility that, even if it is correct and the Project would not cause recreationists to avoid visiting the area, some of them would experience a loss in consumer surplus. That is, some recreationists might find that the presence of the wind-turbine generators on Nantucket Shoals would diminish their enjoyment of the area, but they would visit nonetheless because they would rather recreate here, even with the windmills, than recreate elsewhere. For such individuals, the reduction in their enjoyment of the area would constitute a reduction in consumer's surplus and, hence, a real economic cost attributable to the Project.

To our knowledge, there exists no study that quantifies the potential loss of consumer's surplus. A recent study by the Beacon Hill Institute, however, indicates that the loss could be substantial.[43] The authors, recognizing the difficulty in determining the impact on consumer's surplus of something that does not yet exist (and for which there are no nearby analogs with which people are familiar) surveyed tourists in the area and gathered data that look at consumer's surplus from three different perspectives:

1. **Tourist spending if the Project were built.** More than ten percent of tourists responding to the survey indicated that, if the windmills were built, their tourism spending in the area would decline. The average reduction in spending, per respondent, was greater than $75 per year. When these rates are applied to the current, total number of tourists, they indicate that the total, gross reduction in spending by tourists would be about $57 $123 million.
2. **Royalty rate to allow the Project.** Tourists responding to the survey indicated, on average, that, if the windmills were built, the Project Sponsor should pay a royalty to the federal government equal to about 8 percent of the revenues earned from the wind-turbine generators. The authors of the study concluded that, at this rate, the Project Sponsor would pay a royalty of about $8 million per year.
3. **Direct willingness to pay to stop the Project.** About 5 percent of the tourists responding to the survey indicated that, on average, they would be willing to pay $87.54 to stop the Project. When these rates are applied to the current, total number of tourists, they indicate that the total, gross willingness of the area's tourists to pay to stop the Project would be about $3 $8 million.

Collectively, these numbers provide empirical support for the expectation that the Project would reduce the consumer's surplus some tourists derive from the area's recreational resources. Moreover, these numbers indicate that the costs stemming from the potential loss of consumer's surplus are substantial and may even exceed the Project's economic benefits, which, as we explain above, probably would be much smaller than the Corps' estimates. These numbers must be used cautiously, however. The study by the Beacon Hill Institute gives only insights into the range of potential loss of consumer's

[43] Haughton, Jonathan, Douglas Giuffre, and John Barrett. 2003. *Blowing in the Wind: Offshore Wind and the Cape Cod Economy*. The Beacon Hill Institute. October.

surplus, not the probability that the true loss would be any particular value. Thus, the study's findings do not, by themselves, provide a definitive, precise measurement of the potential loss of consumer's surplus. Absent further research that clarifies the study's findings, though, they stand as the only quantification of the costs the Project would impose on tourists' consumer's surplus, and the Corps should take them into account.

The Corps, of course, also should consider the likelihood that as the Project would reduce the consumer's surplus for tourists who don't want to see windmills on Nantucket Sound, it also would increase consumer's surplus for those who do. The study by the Beacon Hill Institute found (p. 21) that 13.5 percent of the respondents to their survey said they would be willing to pay, on average, $70.33 "to encourage windmills to locate in the Sound."

These numbers, however, are even more problematic to interpret than those just discussed. Under current conditions, electricity consumers would pay additional amounts on their electricity bill to subsidize the Project, and this arrangement has been widely publicized, making it impossible to know if respondents were expressing their acquiescence to making these payments or expressing a desire to pay even more, specifically to site the Project in Nantucket Sound.[44] Moreover, respondents' expressions regarding the apparent increase in consumer's surplus they would experience from the Project are cast into doubt by the statements of more than one percent of the respondents that, if the Project were built they would, on average, spend a whopping 13.1 additional days per year in the area as tourists. Undoubtedly some people would be attracted to view the wind farm and/or related public-education exhibits, especially as long as the Project remains a novelty. As wind-turbine generators become more common, however, this novelty probably would erode.

Whatever the true values of the Project's initial impacts on the consumer's surplus of recreationists and tourists, they almost certainly would evolve over time. They might decrease. Adverse perceptions of windmills elsewhere have diminished over time, although the extent to which this evidence, which comes from sites with significantly different characteristics, is applicable here remains in doubt. Or, they might increase. This would be the outcome, for example, if consumers increasingly came to see the generators as an encroachment of industrialized development on scarce, open seascapes. The Corps' economic analysis should investigate these and related factors that might influence the future magnitude of the Project's impacts on the consumers' surplus of recreationists, and show the implications if a significant increase or decrease in the impacts should materialize.

[44] We recognize that similar ambiguity may apply to some respondents' statements regarding the Project's potential negative impacts.

C. COSTS THE PROJECT WOULD IMPOSE ON PROPERTY OWNERS

The third item in Table 6 identifies the Corps' failure to consider all factors when it analyzed the economic costs associated with the Project's potential impacts on local property owners. The Corps concludes:

> "Based on recent studies conducted in the United Stats and Europe, property and real estate values are generally not affected, or actually increase in areas near wind farm development. Based on these studies, the Project is not expected to adversely affect property values." (p. 5-283)

These statements reflect fundamental deficiencies similar to those present in the Corps' analysis of recreation and tourism. The Corps has relied on a selective reading of the relevant literature, considering only reports that found no adverse impacts on property values, and failing to critically evaluate the extent to which studies elsewhere accurately indicate the Project's potential impacts on local property values.

In the previous section we report studies that show many people believe offshore wind-turbine generators can reduce the value they derive from the surrounding area. More acknowledge that the generators have an adverse effect, but say they are willing to accept this because they recognize the advantages of deriving electricity from renewable sources of energy. In a study in Spain and Portugal, for example, 39 percent of the respondents to a survey stated that the negative effects would be as large or larger than the positive effects.[45]

These and similar findings indicate there is some non-trivial probability that the Project, if implemented, would reduce the value people derive from the area surrounding Nantucket Sound.[46] If such a reduction should materialize, property values in the area could fall, through several mechanisms. If the Project should result in fewer tourists visiting the area, then the demand for tourist-oriented services would decline and, in turn, so too would the prices of tourist-oriented properties.[47] A similar outcome could materialize if the Project did not affect the number of tourists, but caused some to enjoy their visits less and to spend less while in the area. The Project's negative impact on recreationists and tourists also could result in lower prices for residential properties, insofar as reduced demand for tourism-oriented services would lower the demand for labor and, hence, induce some workers to look elsewhere for employment. Or, the Project's impact on residential properties could be more direct. Some people willing to pay a given amount for property

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[45] Iberdrola and Ecossistema. 2001. "Methodological Guidelines for the Environmental and Socioeconomic Impact Assessment of Off-shore Windfarms in Touristic Areas." Altener Programme. www.eia.es/windtour/docs/WINDTOUR.pdf.

[46] The reverse outcome could conceivably materialize, for example, if the Project should become a tourist destination, boost overall tourism, and increase the value people derive from the area's natural resources. We recommend that the Corps investigate both possibilities thoroughly.

[47] Prices might fall absolutely or grow more slowly.

with a view of Nantucket Sound as it is today, for example, might be willing to pay less if the view were cluttered with industrial development.

The results from the study in Spain and Portugal are notable in part for the study's focus on offshore wind-turbine generators in coastal areas recognized as having high recreational and tourist use, similar to the area surrounding Nantucket Sound. The same cannot be said for the information on which the Corps relied. It provides an extensive summary of a study by the Renewable Energy Policy Project (REPP), which looked at data on residential property sold in the vicinity of ten wind-turbine facilities.[48] None of the ten, however, is located in an area with characteristics similar to Nantucket Sound, where tourism related to natural resources is the major segment of the economy and it is reasonable to expect that property derives a significant portion of its value from the scenic amenities of unindustrialized, marine open space. The same is true of properties near the four wind-turbine facilities in the northeastern U.S. the Corps investigated.

The Corps' evidence that comes closest to replicating conditions associated with the Project's potential impact on property values is its citation of a study of the impacts on property values of a wind-turbine facility in Denmark, but it is not the surrounding area apparently does not have the scenic amenities present in Nantucket Sound.[49] Moreover, the Corps' description of the study shows that its authors based their conclusions on shaky information: "reports that most of the people living in the neighboring area accept the wind farm and there have been no reported lighting or noise-related impacts" (p. 5-275).

A more rigorous research effort is underway to investigate the impacts of offshore wind-turbine generators in Denmark on local property values. Results of the study have not yet been released, to our knowledge, but a status report on the study explains that it is being undertaken because there are widespread concerns about the visual impacts of offshore generators as they become larger and more numerous:[50]

> "[T]he turbines that are built now have a much more dominating impact on the surroundings than the turbines built 10 or 20 years ago. The larger the turbines are, the greater are the areas in which people potentially may be bothered by visual or noise externalities generated by the turbines. Combined with the already high density of wind turbines, this implies that it is becoming increasingly difficult to find areas that are both technically and socially acceptable for the placing of new land-based turbines.
>
> "Despite the intuitive appeal of taking wind power production to sea, off-shore wind farm projects have meet opposition both at the national and at the local level. The

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[48] Sterzinger, G., F. Beck, and D. Kostiuk. 2003. *The Effect of Wind Development on Local Property Values.* Renewable Energy Policy Project. May.

[49] The Corps also cites a newspaper article that quotes a local real estate agent as saying there has been no impact.

[50] Dubgaard, A. 2004. *Annual Status Report 2003: Economic Valuation of the Visual Externalities of Off-Shore Wind Farms.* KVL: The Royal Veterinary and Agricultural University, Denmark. http://www.hornsrev.dk/Miljoeforhold/miljoerapporter/POST-CONSTRUCTION-Annual%20Report-2003-Economic%20valuation%20of%20the%20visual%20externalities%20of%20off-shore%20wind%20farms.pdf.

motives underlying the opposition may be attitudinal or psychological in character; e.g. it may be motivated by a – perhaps only temporary – opposition to change, a sense of having been left out of the decision process, a desire to express discontent with the underlying energy policy or a strong ecological conviction that the sea should remain untouched. The motives may however also be economic in the sense that the opposition may be caused by a rational concern for the biological and marine environment, actual or expected losses of amenity value due to visual externalities, reduced earnings in the tourist sector and/or declining catches of fish caused by reductions in the area available for fisheries.

"The purpose of the present study is to estimate the monetary value of the visual externalities of offshore wind farms and to conduct a cost-benefit analysis of socially optimal locations of off-shore wind farms." (pp. 1-2)

Concern about the negative impacts on property values also has been expressed by the Royal Institution of Chartered Surveyors, an organization that represents appraisers and similar professions in the U.K. and elsewhere. From a survey of its members regarding their experience with the impacts on wind-turbine generators on property values, the organization reached these conclusions:[51]

"Whilst wind farm technologies offer many advantages, questions are being asked about the potential impact of this expansion on property values, particularly in the residential sphere.

"In order to examine whether there is any substance in these concerns, and to monitor the effects on land and residential property affected by wind farm developments, RICS (The Royal Institution of Chartered Surveyors) has carried out an initial study to examine the impact of wind farm development. The purpose of the study is not to endorse or criticise wind technology, but rather to gauge professional property opinion about its impact on both residential property and agricultural land values.

"RICS conducted an initial questionnaire-based survey among its members at the beginning of September 2004.

"The findings suggest three effects of wind farms on the value of residential property and agricultural land:

- there are negative influences on the value of residential properties, though a sizeable minority report no impact on prices
- the influence is much less on agricultural land values, to the point that the majority of responses suggested the impact was nil
- nowhere is it considered that wind farms positively affect residential property values, although there was evidence of some positive impact on agricultural land

More than half (60%) of those surveyors involved in residential property transactions affected by a wind farm development (i.e where a wind farm is visible from the property), reported that values were lower than for comparable properties which were unaffected (Figure 1). However, this still leaves a sizeable minority of 40% of surveyors reporting no impact from wind farm developments on values.

A recent review by one of the Corps' sister agencies, the Tennessee Valley Authority reached a similar conclusion: wind-turbine generators can have a

[51] The Royal Institution of Chartered Surveyors. 2004. *Impact of Wind Farms on the Value of Residential Property and Agricultural Land.* November. www.rics.org/NR/rdonlyres/66225A93-840F-49F2-8820-0EBCCC29E8A4/0/Windfarmsfinalreport.pdf

negative impact on property values.[52] The authors' review of the literature stated that the actual impact depends on the specific setting:

> "Many people are supportive of wind power and other alternative energy sources because of such concerns as global warming and air pollution—the macro-scale. At the same time, however, they may have concerns about the impacts of proposed projects because of their potential to disturb their immediate environment—the micro-scale. This disturbance might take the form of visual changes to the landscape or noise intrusion, and could, if significant enough, have negative impacts on property values.
>
> "Other research related to property values, but not specific to windfarms, may also be useful in understanding these impacts. Studies on the relationship of views and property values show that desirable views do have a positive value on property values. For example, a study by Rodriguez and Sirmans (Rodriguez and Sirmans, 1994), based on data from Fairfax County, Virginia, found that a good view added about 8 percent to the market value of a home. Another study, looking at vacant property on Seabrook Island, off the South Carolina coast, found that views had significant impacts on the value of the property (Rinehart and Pompe, 1999). An ocean view added 147 percent to the market value of a lot (vacant lot, not a home), view of a creek or marsh, 115 percent, and a golf course view, 39 percent. Similar results have been found for the impacts of other environmental amenities, such as open space, proximity to recreational trails, and improved coastal wetlands (Bradec, 1992; Brabec and Kirby, 1992; Earnhart, 2001).
>
> "These studies are consistent with the expectation of some negative impact on property values from a windfarm that has significant negative visual impacts [and] it is possible that in specific cases, impacts would be greater than the range shown by the studies cited, but there appears to be no research to validate general claims of such large impacts."

The observations regarding the impacts of different visual amenities on property values highlights the inadequacy of the Corps' attempt to transfer the results from studies elsewhere to this location. We have seen no evidence indicating that any of the existing wind farms in the U.S. is located in an area where the visual amenities, absent the wind farm, are powerful enough to raise property values by 147 percent, the observed effect of an ocean view. Many are located where the visual amenities are nonexistent, or nearly so: the study by REPP, for example, considers sites in the flat farm country of Texas and Iowa, and others in hilly, developed areas. In places where the visual amenities add little to property values, the installation of industrial structures, such as wind-turbine generators, can do little to compromise the amenities and reduce property values. The situation in Nantucket Sound is markedly different and, hence, the Corps' attempt to transfer evidence from elsewhere to this setting is inaccurate and inappropriate.

In sum, the Corps has relied on only some of the literature and evidence regarding the Project's potential impacts on property values. It failed, however, to recognize that, for the most part, this literature and evidence is inapplicable to this setting. Moreover, the Corps disregarded studies and evidence indicating that, because of the particular characteristics of Nantucket Sound, the Project may have a non-trivial, negative impact on the

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[52] Tennessee Valley Authority. 2002. *Environmental Assessment: 20-MW Windfarm and Associated Energy Storage Facility, Appendix F--The Impact of Views on Property Values*. April. http://www.tva.gov/environment/reports/windfarm/appendix_f.pdf

value people place on the area's natural resources. If such a negative impact should materialize, property values in the area might decline. The Corps must expand its analysis to embrace a broader consideration of all the relevant literature before it can justifiably claim that it has estimated the Project's impacts on property values with reasonable certainty.

The Corps compounds its failure to adequately review the relevant literature by not describing all of the views that the Project would affect and the relative importance of these views to property values. As described by James F. Palmer in his comments on the Corps' analysis of the Project's aesthetic impacts, the Corps has not identified the entire view shed that the Project would affect, nor has it studied the properties within this view shed.[53] Without a thorough review of the relevant literature, and without studying the view shed and affected properties, the Corps has no basis in fact for its conclusions regarding the Project's impacts on property values.

D. REDUCTIONS IN THE ECOSYSTEM'S NON-USE VALUES

The fourth item in Table 6 identifies the Corps' failure to consider the Project's impacts on the ecosystem's nonuse values, i.e., values people ascribe to the ecosystem even though they do not actively use its resources. The Corps did not analyze the Project's potential impact on the ecosystem's:

- Existence value, which is the value some people place on knowing that the ecosystem exists, with significant parts undeveloped and able to function in a more or less natural manner.
- Bequest value, which is the value some people place on being able to pass to the next generation the ecosystem in its current state.
- Option value, which is the value some people place on keeping the ecosystem unimpaired, so that potential future uses are not compromised.

To assist the Corps in correcting its failure to analyze the Project's potential impact on the ecosystem's nonuse values, we offer the following information:

- A recent report by the National Research Council on managing marine resources describes heritage (bequest) and existence values and notes the intergenerational importance of considering these values:[54]

  > "Some of the services provided by marine ecosystems have market prices that can be adjusted to reflect their direct economic value. For example, the market prices of fishery products are commonly monitored and recorded in order to gauge the apparent values that consumers place on fishery products as well as the input costs used to provide these products. At the same time, market prices are not available for all services and, in some cases, may underestimate the true value of natural resource services. Market prices also may not give the correct

[53] *See* comments on the Draft EIS/EIR by James F. Palmer.

[54] National Research Council. 2005. *Marine Protected Areas: Tools For Sustaining Ocean Ecosystems*. Ocean Studies Board, Commission on Geosciences, Environment, and Resources. www.nap.edu.

'signals' about values that might be associated with either marine products or marine ecosystem services in the future."(pp. 49-50)

This report also summarizes the literature on methods of estimating nonuse values.

- A recent analysis of the economics of marine-resource management describes consumptive and nonconsumptive values.[55] Nonconsumptive values include existence and bequest values.
- An analysis of the economic consequences of establishing the Stellwagen Bank National Marine Sanctuary includes a discussion of the Bank's existence values.[56]
- A recent study of the socioeconomic impacts of establishing the Channel Islands National Marine Sanctuary summarizes the literature on option, bequest and existence values and related these values to marine resources.[57] The researchers conclude that marine resources can have significant nonuse values and for this reason should not be ignored even though analysts may not be able to quantify these values precisely.

  "All the benefits and costs of marine reserves cannot be quantified, and so a formal benefit-cost analysis is not conducted. Instead, we use the benefit-cost framework and list all the potential benefits and costs, and quantify them where we can. Where we can't quantify benefits or costs, we discuss them qualitatively and in what direction we believe benefits or costs will move ...." (p. 1)

  The approach demonstrates the analytical feasibility of taking a broad analytical perspective, providing as much economic information as possible. This contrasts with the Corps' analysis, which disregards or fails to disclose relevant information regarding the project's potential economic impacts.

To our knowledge, there exists no reliable estimate of the non-use values associated with Nantucket Sound that might be degraded by the Project. Studies elsewhere, though, suggest that that these values may be substantial. The recent analysis of the socioeconomic impacts of establishing the Channel Islands National Marine Sanctuary (CINMS), for example, found that the non-use values of protecting areas within the sanctuary outweigh the potential benefits of continuing to allow consumptive uses in the areas.[58]

"Here we provide a net assessment using the National Net Benefits Approach. Under this approach, only consumer's surplus and economic rent values are

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[55] Carter, D. 2003. "Protected Areas In Marine Resource Management: Another Look At The Economics and Research Issues." *Ocean & Coastal Management* 46, 439-456.

[56] Perez, M, and Ruth, M. 2002. *Effectiveness and Economic Benefits of Stellwagen Bank National Marine Sanctuary*. A report prepared for Environmental Defense. February.

[57] Leeworthy, V. and Wiley, P. 2002. *Socioeconomic Impact Analysis of Marine Reserve Alternatives for the Channel Islands National Marine Sanctuary*. A report for the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service. April 29.

[58] Leeworthy, V. and Wiley, P. 2002. *Socioeconomic Impact Analysis Of Marine Reserve Alternatives For The Channel Islands National Marine Sanctuary*. A report for the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service. April 29.

> appropriate for consideration, as in a formal benefit-cost analysis. We are not able to quantify all the costs and benefits, especially not across all alternatives, as with the nonuse or passive economic use values. But with certain assumptions designed to bias the result in favor of the consumptive activities, we show that the nonuse or passive economic use values would likely exceed all consumptive use values." (p. 108)

In their summary of the relevant literature, the study's authors found there significant evidence supporting the conclusion that the non-use values Americans place on protecting ocean ecosystems is considerable:

> **Factors Supporting Positive Nonuse Economic Value.** We reviewed four studies based on National surveys of U.S. households that evaluated adult's perceptions and concerns about the environment. In addition, one of the studies focused specifically on ocean related issues (SeaWeb, 1996) and found strong support for marine protected areas. One more recent study (SeaWeb, 2001) directly addressed the issue of marine protected areas and fully protected marine reserves. Each of the surveys demonstrated that U.S. citizens have a high level of concern about the environment and believe the environment is threatened and requires action and overwhelming support the creation of marine reserves. One recent study based on a survey of Californians (SeaWeb, 2002) found support for ... marine reserves in the CINMS. (p. 103, bold emphasis in original)

These observations echo the findings of other studies that have examined the non-use values associated with healthy, undeveloped ecosystems. An extensive study of federal lands in the interior Columbia River Basin, for example, found that the non-use values associated with undeveloped lands was roughly half the total value of all goods and services derived from those lands.[59] Also, a national study following the *Exxon Valdez* oil spill found that households expressed a willingness to pay $31 (median value) as a one-time tax to support measures that would prevent similar oil spills in the future.[60]

A separate expression of concern regarding the non-use values that might be diminished by offshore wind generators comes from the international Convention on the conservation of Migratory Species of Wild Animals. The U.S. is not a party to the convention but it participates in its agreements. Recognizing that offshore wind turbines can have significant benefits, including a positive impact on trends in climate change, the parties to the convention noted that "wind turbines especially in marine areas represent a new technique of large scale energy production, the actual effects of which on nature and on different components of biodiversity cannot be fully assessed or predicted at present." Based on this observation, the parties called upon the member nations "to take full account of the precautionary principle in the development of wind turbine plants, and to develop wind energy parks taking account of environmental impact data as and monitoring information as it

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[59] Haynes, R.W. and A.L. Horne. 1997. "Chapter 6: Economic Assessment of the Basin." In *An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins, Volume IV.* Edited by T.M. Quigley and S.J. Arbelbide. General Technical Report PNW-GTR-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. June. Pgs. 1715-1869.

[60] Carson, R.T., C. Mitchell, W.M. Hanemann, R.J. Kopp, S. Presser, and P.A. Rudd. 1997. *National Survey Report March 31, 1992, Draft.* November 6. www.rff.org/~kopp/Reports/alaska.pdf.

emerges and taking account of exchange of information provided through the spatial planning processes.[61]

E. JEOPARDY TO INVESTMENTS IN THE ECOSYSTEM

The final item in Table 6 identifies the Corps' failure to consider the Project's potential, adverse impacts on past, present, and future investments by individuals, communities, and the Commonwealth of Massachusetts in protecting the health of the ecosystem that includes Nantucket Sound. The Commonwealth of Massachusetts, local communities, and stakeholders have long recognized the ecological and economic importance of Nantucket Sound's marine resources. Protecting the Sound's biological diversity, pristine qualities and unique habitats has been a priority of resource-management agencies and interest groups for more than thirty years. Long-term planning goals for the Sound include coordinating management and protection efforts among the Commonwealth and federal agencies that have jurisdiction over the Sounds' resources.[62] If implemented, the Project would jeopardize the productivity of these investments and compromise on-going efforts to accomplish long-term, ecological and economic goals for the area.

A recent report by the Center for Coastal Studies (CCS) describes the ecological resources, protection efforts and management plans that the Project potentially threatens. [63]

- The Sound contains habitat for protected species including roseate terns, piping plovers, leatherback sea turtles, loggerhead sea turtles, Kemp's Ridley sea turtles, and grey seals. (p. i)
- Nantucket Sound includes biologically-diverse habitats that range from open sea to salt marshes. These complex and diverse ecosystems remain the focus of continued scientific research. (p. 3)
- The Commonwealth's legislature passed the Massachusetts Ocean Sanctuaries Act in 1970. The Act created five ocean sanctuaries, one of which" the Cape and Islands Ocean Sanctuary" included the sections of Nantucket Sound over which the state has jurisdiction. (p. 1) Especially relevant to the Corps' review of the Project's impacts on local protection efforts is the fact that the Act prohibits constructing permanent structures or citing energy facilities within sanctuaries,

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[61] Convention on the Conservation of Migratory Species of Wild Animals. 2002. "Resolution 7.5: Wind Turbines and Migratory Species." http://www.cms.int/bodies/COP/cop7/proceedings/pdf/en/part_I/Res_Rec/RES_7_05_Wind_Turbine.pdf

[62] Center for Coastal Studies. 2003. *Review of State and Federal Marine Protection of the Ecological Resources of Nantucket Sound.* 26 pages. January 28.

[63] Center for Coastal Studies. 2003. *Review of State and Federal Marine Protection of the Ecological Resources of Nantucket Sound.* January 28. *See* also, Provincetown Center for Coastal Studies. 2005. *Toward an Ocean Vision for the Nantucket Shelf Region.* January.

"The Massachusetts Ocean Sanctuaries Act obliges the Department of Environmental Management ... to protect the sanctuaries from any development or activity that would damage the ecology or aesthetics of the area. Specifically prohibited within Massachusetts Ocean Sanctuaries are the construction of physical structures on the seabed, the building of offshore or floating power plants, ..." (p. 6)

- The Sound was twice nominated for National Marine Sanctuary status as a means of protecting areas of the Sound not included in the Cape and Islands Ocean Sanctuary. The review committee did not ultimately follow through on the nomination, noting the challenges of managing diverse ecosystems that cross multi-jurisdictional (Commonwealth and federal) boundaries. (p. 9-11)
- The Commonwealth noted that denying sanctuary status for the federal portion of the Sound leaves vulnerable the ecosystems in this area and threatens the resource-protection efforts and expenditures in the Commonwealth-protected areas,

  "The absence of marine sanctuary protection for the federal waters in the center of the Sound would negate efforts by the Commonwealth of Massachusetts to insure the environmental protection of the marine resources of this important water body through its Ocean Sanctuaries Program. Nantucket Sound must have a coordinated management regime ... if the ecological, recreational, historic and aesthetic resources of the Sound are to be adequately protected." (p. 10)

Another indication of the extent to which local stakeholders value and support the region's ecosystems is the hundreds of millions of dollars spent by local land trusts to purchase and protect habitats on Nantucket, Cape Cod and Martha's Vineyard. These protection efforts include:

- The Nantucket Land Bank Commission spent over $115 million between January 1, 1984 and June 30, 2004 purchasing habitat on Nantucket Island.[64]
- To date, the Nantucket Conservation Foundation purchased approximately 4,800 acres of habitat on Nantucket Island.[65]
- Through 2004, the Martha's Vineyard Land Bank spent approximately $88 million on land acquisitions for conservation purposes.[66]
- Between January 1999 and December 2002, the Cape Cod Land Bank spent approximately $94 million purchasing lands with significant habitat.[67]

The Commonwealth, with support from local jurisdictions and stakeholders, has expressed its commitment to maintaining and protecting the ecological resources of Nantucket Sound by passing the Massachusetts Ocean

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[64] Personal Communication with Craig Hunter, the Office Administrator of the Nantucket Land Bank Commission, January 6, 2005.

[65] The Nantucket Conservation Foundation, Inc. *Properties Map.* www.nantucketconservation.com/info_files/properties/map.html. Accessed on January 7, 2005.

[66] Personal Communication with Cindy Krauss, the Fiscal Officer of the Martha's Vineyard Land Bank. January 10, 2005.

[67] Cape Cod Land Bank. *Acquisition Status: Data Through December 2002.* www.capecodcommission.org/landbank/acquisition.htm.

Sanctuaries Act, by twice nominating the Sound for national marine sanctuary status, and by supporting land trusts that purchase and protect important terrestrial habitat that boarders the Sound. Local sentiment supports prohibiting building permanent structures and energy projects in the Sound. The Commonwealth has expressed its concerns regarding the consequences of developments in the federal portion of the Sound on protection efforts and management plans in neighboring waters under the Commonwealthís jurisdiction. The proposed site of the Project is surrounded by state lands and waters. If state jurisdiction extended to the site, state regulations would bar the Projectís development.

The Project would undermine these resource-protection planning efforts and investments. With its implementation, the Commonwealth, local jurisdictions, and stakeholders would have to work harder and increase their investments to accomplish their goals insofar as the Project would pose risks to the ecosystem birds and interfere with and restrict historical uses of the area, such as fishing. In effect, the Project Sponsor would be pushing costs onto others to cope with the risks stemming from the unknown impacts of the Projectís blades on birds and its electromagnetic fields on marine life, as well as the risks associated with potential oil spills and other accidents.

The Corpsí analysis provides no information on the extent to which the Project would reduce the efficacy of resource-protection planning efforts and investments in the areaís ecosystem. To correct this deficiency, it must fully document these efforts and investments and describe the Projectís potential impacts on them.

VII. DEFICIENCIES IN THE CORPS' ANALYSIS OF RISKS ASSOCIATED WITH THE PROJECT

Projecting the Project's economic effects over the next 25 years and beyond is a difficult exercise that requires making many assumptions about many key variables. It is an exercise that inherently embodies many uncertainties. Before the Corps can demonstrate, with reasonable certainty, that the Project's benefits outweigh its costs, it must do more than evaluate the Project assuming that everything will occur as planned.[68] It must also consider the economic consequences if one or more things go wrong.

The Corps has not thoroughly considered the economic risks and uncertainties associated with the Project. Particularly important are the three categories of deficiencies in its analysis, shown in Table 7.[69]

Table 7. Summary of Deficiencies in the Corps' Analysis of Risks Associated with the Project

Component of Analysis	Deficiency
Financial risk, including risk of technological failure	Missing
Economic aspects of ecological risk	Missing
Navigation risk	Incomplete analysis

The first item in Table 7 identifies the Corps' failure to assess the risks associated with the Project's financial feasibility. Unless the Project Sponsor has unlimited resources to dedicate on the Project, should something go wrong, then there is some probability that it would lack sufficient resources to build, operate, and decommission the Project as planned. At the extreme, the Project Sponsor would go bankrupt, operation and maintenance of the facilities would be halted, and the wind-turbine generators would be abandoned on-site.

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[68] Guidance for how to conduct an analysis of risk and uncertainty is available to the Corps from the *Principles and Guidelines*, discussed above, and from the agency's manuals. *See* U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. 1991. *National Economic Development Procedures Manual: Overview Manual for Conducting National Economic Development Analysis.* IWR Report 91-R-11. October; and U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. 1992. *Guidelines for Risk and Uncertainty Analysis in Water Resources Planning, Volume I: Principles.* IWR Report 92-R-1. March.

[69] Technical discussions of things that can go wrong sometimes distinguish between narrow interpretations of the terms, risk and uncertainty, with risk referring to those things whose probability of occurrence is known and uncertainty referring to those whose probability is not. To facilitate the discussion, we use the term, risk, in a broader sense to refer to both.

The Corps has not analyzed the Project's financial risks. Specifically, it has not evaluated:

- The extent to which the Project's financial feasibility depends on continued federal and state tax-abatements or subsidy programs, and the financial performance of the Project if these programs ceased.[70]
- The overall financial risks associated with merchant-power projects in the New England market given the recent bankruptcy filings and down-graded credit ratings for electricity producers in this market.[71]
- The Project-specific financial risks, including risks associated with its technology and its location.

There is much that remains unknown regarding the financial risks for the Project Sponsor stemming from the possibility that the Project might experience technological failure. The Project would push technology beyond the current envelope. It would be the first offshore, utility-scale, wind-powered generating plant in the U.S. Its generators with a generating capacity of 3.6 MW per turbine, would be twice the size of the largest land-based wind turbines previous installed in a utility-scale project in the U.S.[72] Moreover, the Project Sponsor has no experience with this type of project.

There also is much that remains unknown regarding the financial risks for the Project Sponsor stemming from the Project's proposed location. The Corps has not analyzed the potential financial and operational consequences if, for example, the Project should prove to have devastating impacts on birds or other wildlife, or if public discontent with having 130 generators operating at the site should grow.

The Corps' failure to analyze technological risks is at odds with the experience and concerns of the wind-power industry. A recent survey, sponsored by the British Wind Energy Association of "key players in the wind industry and related sectors" in the U.K. produced these observations:[73]

> "Technology risk is often cited as being the major issue in the development of offshore wind. Certainly there is great temptation to move to larger turbines quickly and sponsors who wish to take risk on new technology in order to get higher returns will undoubtedly have to find more equity for their projects. ...
>
> "It is the operational aspects of offshore wind farms, which are the most uncertain. Methods of access, the times when access can be gained, and other aspects of maintenance procedures are still debated.
>
> "Safety is an issue raised in a number of interviews in the survey. The industry is still developing solutions to the problem of safe and secure maintenance at large scale.

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[70] Evidence from the U.K. indicates financial support for offshore wind generators is sensitive to the degree of governmental support for the industry, and uncertainty about future governmental incentives can erode the supply of capital for offshore projects. *See* Temperton, I. 2003. "Financing Wind Beyond 2010: Survey Results." British Wind Energy Association. September. http://www.bwea.com/pdf/RO-Review-SurveyResults.pdf.

[71] Benson. 2004. U.S. Department of Energy White Paper. June 6.

[72] Peer-review committee, p. 9-10.

[73] Temperton, I. 2003. "Financing Wind Beyond 2010: Survey Results." British Wind Energy Association. September. http://www.bwea.com/pdf/RO-Review-SurveyResults.pdf.

> However, this again is an issue on which there is much innovation and is an issue for the private sector and the relevant safety authorities." (p. 17)

The economic analysis in the Draft EIS/EIR is not consistent with these observations. It does not recognize that, among those with experience with offshore development of wind-powered generators "Technology risk is often cited as being the major issue in the development of offshore wind." Failing to recognize the significance of this risk, it fails to evaluate its consequences.

The second item in Table 7 identifies the Corps' failure to analyze the economic aspects of the Project's potential adverse ecological impacts. It has not, for example, estimated the economic values associated with bird kills or with ecological disruption stemming from noise, vibrations, and electromagnetic fields. It also has not estimated the economic values of ecological damage that would occur if the Project were to experience an oil leak from one or more generators or to contribute to a navigational accident involving an oil leak.

The third item in Table 7 identifies the Corps' failure to conduct a complete and thorough risk assessment of the Project's navigational hazards. The McGowan Group reviewed the proponent's assessment of navigational risks and found the assessment lacking.[74] As described in the McGowan Group's report, deficiencies in the proponent's risk assessment include:

> "Cape Wind's proposed Horseshoe Shoal location is at odds with common international practice and threatens disruption of the Main Channel as a marine transportation route.
>
> Cape Wind's proposal for a Nantucket Sound site is fatally flawed in that it appears incompatible with marine transportation activity and poses unnecessary and unacceptable risks to cruise and ferry vessel, oil transport, fishing and recreational users.
>
> Cape Wind proposes an inferior tower structural design, which may catastrophically fail if struck by known marine threats.
>
> The Cape Wind assessment severely underestimates the safety and pollution consequences including loss of life and injury resulting from vessel collisions with a wind tower or with their rotating blades.
>
> The Cape Wind assessment fails to explore the negative impacts to the Nantucket Sound fishing industry by acknowledging that these projects will effectively cutoff all trawling/dragging within the entire confines of the wind farm." (p. iii-iv)

The Corps' nonexistent or incomplete economic assessments of the Project's financial, ecological, and navigational risks prevents a thorough review of the Project's benefits, costs, and feasibility. Without thorough assessments, it is impossible to discern from the draft EIS/EIR if the Project's economic benefits outweigh its economic costs.

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[74] The McGowan Group. 2004. *Cape Wind Offshore Wind Farm: A Navigational Risk Assessment Review.* The Alliance to Protect Nantucket Sound. April 26.

BCG
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EXHIBIT 5

January 16, 2003

Doug Yearley
President & CEO
Alliance to Protect Nantucket Sound
396 Main Street, Suite 2
Hyannis, MA 02601

Subject: Report for Phase 1 Certification of Economic Analyses for Alliance to Protect Nantucket Sound

Dear Mr. Yearley:

Byron Consulting Group (BCG) is pleased to provide you with this letter report summarizing the results of the Phase 1 review and analysis. The objective of Phase 1 was to certify a cost analysis of a number of power project alternatives in the Massachusetts area performed by Oxbow Engineering.

Summary

A private company, Cape Wind Associates, LLC, has proposed to develop a number of offshore wind farms along the northeastern coastline of the United States. These proposed developments are distinctive for a number of reasons and pose numerous concerns for both residents and businesses in the area. One of these projects is a 28 square mile matrix of windmills in Nantucket Bay.

A nonprofit organization, The Alliance to Protect Nantucket Sound (APNS), is a coalition of residents, businesses, civic groups, and local governmental organizations who oppose the project and are conducting independent analysis and evaluations of the legal, technical, and economic feasibility of the project. To date, this effort includes a financial comparison of alternative power projects in the Massachusetts area.

Byron Consulting Group has conducted an independent evaluation of the proposed Cape Wind project costs and four alternatives and finds the work done by Oxbow Engineering to be thorough, complete, and accurate. The analysis has been independently verified and found to be within a reasonable degree of accuracy for comparative analysis of the alternatives. This report summarizes the supporting material for this conclusion.

Approach

BCG has taken the following approach in conducting its analysis in Phase 1:

- Review existing Oxbow Engineering analysis for completeness
- Correct potential errors or omissions in the analysis
- Conduct an independent verification of the economic modeling
- Draw conclusions about the accuracy of the analysis
- Conclude with recommendations for further action

The remainder of this report follows this outline.

Review of Oxbow Engineering Analysis

Oxbow Engineering provided BCG with copies of output sheets for five different electric power plant economic models. The five models that were selected and originally analyzed by Oxbow Engineering were:

Table 1: Power Plant Alternatives Analyzed by Oxbow Engineering

Model No.	Power Plant Type	Size (MW)
1	Combined Cycle Gas-fired	530.9
2	CFB Coal-fired	400.0
3	Petroleum Coke-fired	400.0
4	Hydroelectric	80.0
5	Offshore Wind	420.0

BCG was also provided with a summary table indicating the important assumptions and results from the analysis performed by Oxbow Engineering. Table 2 duplicates this information:

Table 2: Cost Analysis and Prices Needed for Power Projects in Massachusetts

Technology/ Fuel Source	Electricity Price ($/MWh)	Federal Tax Credit ($/MWh)	Total Construction Cost ($/kW)	Fuel Cost ($/MWh)	Non-Fuel Variable Cost ($/MWh)	Fixed Operating Costs ($/MWh)
Gas-Fired	42.20	0	497.00	21.20	0	6.50
Coal-Fired	64.00	0	1,480.00	15.20	4.80	11.20
Pet-Coke	55.50	0	1,483.00	5.30	6.30	11.20
Hydroelectric	61.50	0	1,999.00	0	0	17.80
Offshore Wind	66.00	18.00	1,961.00	0	4.30	18.10

From Oxbow Engineering

The analysis conducted by Oxbow Engineering was done using a company proprietary economic model that required a number of input assumptions. BCG has reviewed the summary sheets from the models for the five different projects to determine the input assumptions. Rick Hathaway and Ro Chib of Oxbow Engineering provided additional responses to questions and additional backup material, including a copy of Cape Wind Environmental Notification Form (11/15/01).

Table 3 is a summary of the critical input assumptions that were used in the analyses. The table includes a summary of how the assumption was reached followed by a brief analysis of the significance and accuracy of the assumption.

Table 3: Evaluation of Input Assumptions

	Assumption	Discussion	Analysis
1	Engineering, procurement, and construction (EPC) costs	Oxbow EPC values for model 1 through 4 were based primarily on company and industry experience for these mature technologies. EPC for model 5 was developed based on limited available industry data, and was obtained primarily from the European Wind Energy Association (EWEA) and ENF.	This is a major assumption for the analyses of all models. Values for models 1 through 4 can be highly variable depending upon plant location and resulting labor costs, however, these costs are also based upon a significant experience-base. Model 5 costs are far more uncertain, however, Oxbow made reasonable and defensible assumptions that allow for a fair comparison of the different models.
2	Cost completeness	All models include material, regionally adjusted labor, capital costs, contingency, insurance, permitting, engineering, construction management, start-up, financing, debt service initial working capital fund, and net interest during construction. Land costs were only included for models 4 and 5.	Full and fair accumulation of costs is critical for an impartial comparison of the models. Oxbow collected complete costs and made an even-handed application of costs amongst the different models, except for perhaps land costs on models 1 through 3. However, land costs have a relatively small impact on results.
3	Time of use energy cost	Oxbow assumed the same value for electricity	For relative comparison of models this is a reasonable

		generated on-peak and off-peak.	assumption. However, the value of electricity changes during the day and season and could have a significant impact on the results for model 5.
4	Capacity factors for models 1 to 4	Oxbow assumed capacity factors for models 1 through 4 based upon industry experience. Capacity factor for model 5 was calculated based upon the stated output of the plant by Cape Wind.	The capacity factors for models 1 though 4 are reasonable and defensible. The capacity factor for model 5 was calculated in a reasonable manner and is significant less than the other models. Capacity factors have a significant affect on the financial performance of the plants.
5	Capacity factors for model 5 (wind)	Oxbow assumed a capacity factor of 40.5% for model 5 based upon the stated output of the plant by Cape Wind. This was calculated from stated annual output divided by the number hours in a year and the size of the wind plant.	Wind Power (wind trade associate in Denmark) states that the "ideal" capacity factor is between 25 to 30%. Cape Wind has assumed a larger capacity for offshore generation. This higher capacity rating is generous, given that machines of this size are still in development and do not have any appreciable operating history.
6	Escalation of O&M costs	Escalation on O&M costs was assumed to be 2.5%/yr. for all models.	This is a reasonable assumption and applying it to all models makes for an equitable comparison.
7	Performance degradation	For models 1 to 3 output performance was assumed to degrade 1%/yr. For models 4 and 5, no degradation was assumed.	These assumptions are reasonable for models 1 to 4. Since no offshore wind turbine operating experience exists for machines of this size, it is not possible to determine a value. It is generous to assume no degradation for model 5.

8	O&M costs	Non-fuel variable and fixed operating costs assumed for the five models are shown in Table 1. Non-fuel variable costs for model 1and 4 are included in the fixed operating costs. For models 2 and 3, non-fuel variable costs, such as limestone, ash disposal and ammonia, are shown as such.	O&M for models 1 through 4 are well documented through experience and were applied correctly. Costs for model 5 were based upon EWEA, which provides a range of Fixed O&M costs from $12 to 24/kW-yr, and Variable O&M from $2 to 4/MWh. Oxbow assumed a value to the low end of the fixed cost range due to economy of scale for the large facility and assumed a value to the high side of variable cost due to severe operating conditions. O&M for offshore wind is relatively unknown for large machines and the values for model 5 are generous.
9	Fuel costs	Models 1 through 3 are highly sensitive to fuel cost. Oxbow assumed a natural gas cost of $3/MMBtu, coal cost of $40/ton, pet-coke cost of $15/ton. No escalation of fuel costs was assumed.	Models are highly sensitive to fuel costs. For prior ten years natural gas costs have averaged approximately $2.50/MMBtu. Recently, Henry Hub prices hit a high of $5.50/MMBtu due to recent strike in Venezuela and onset of a cold US winter. Costs assumed by Oxbow are reasonable for a relative comparison.
10	Production tax credits	The production tax credit for model 5 is assumed to persist for the life of the project.	This is a reasonable and generous assumption, however, removal of the PTC would significantly affect the sales price for electricity from wind.
11	Cost of money	Values assumed were approximately the same for all models.	Reasonable values were assumed and applied consistently, resulting in a fair comparison.

12	Life expectancy of assets	Life expectancy was assumed to be: Model / Years 1 / 20 2 / 25 3 / 25 4 / 30 5 / 25	Asset life for models 1 to 4 is experienced-base and reasonable. There is no historical basis for the life that can be reasonably assumed for offshore wind turbines of this size. Wind Power typically assumes a 20 year asset life for land-based turbines and makes the assumption that offshore machines could last 25 years due to lower turbulence. The electric production cost difference between 20 and 25 year life is 9% while the difference between 15 and 20 year life is nearly 20%. Asset life has a major effect on cost structure. Model 5 generously uses 25 year asset life.
13	Return on investment	Assumed to be 20% for each model.	This is a reasonable hurdle rate for power plant investments and allows for a fair comparison of the five models
14	Production Tax Credit	Assumed to be $19/MWh in first year of operation (2005) and increased $0.50/MWh/yr.	The PTC is applied correctly, increasing annually with what appears to be an annual 2.5% CPI increase. This assumption is valid as long as the PTC remains in effect.

Discussion of Errors and Omissions

The overall conclusion of the BCG review of the assumptions made in the five models is that they are thorough and complete. BCG uncovered no major errors or omissions. As will be discussed later in this report, BCG also confirmed the analyses conducted with a simplified and independent economic analysis of each of the models.

A relative comparison of different power plant types allows for some latitude in the assumptions made, as long as these are applied equitably. Oxbow has done an excellent and even-handed job of doing this. Nevertheless, others could take exception to a few of the assumptions as mentioned in Table 3. For example, fuel costs are a significant operating cost in models 1 through 3. For the past 10 years, average natural gas costs have been approximately $2.50/MMBtu. More recently these costs have been near $5.00/MMBtu due to a recent strike in Venezuela and increased demand on fuel oil prices from a cold winter in the northeast. Every dollar increase in natural gas costs increases the production cost of electricity by $7.20/kWh. Therefore, conclusions about this model should keep in mind the impact that volatility of natural gas price would have upon the results.

An evaluation of the five models has revealed relatively few assumptions that could be problematic to defend. Table 4 lists a summary of these assumptions, the potential implication, and the recommended course of action.

Table 4: Potentially Questionable Model Assumptions

	Assumption	Implication	Recommendation
1	Land Purchase	Land purchase costs were not assumed in the fossil fuel models (1, 2 and 3) and could increase electric production costs by up to as much as 1%.	This small omission would not have an appreciable impact on the results. Recommendation is to take the position that new plants in New England would likely be retrofitted on an existing site, not require land purchase, and, therefore, recommendation is to not redo the analysis.
2	Fuel Prices	Recent years have shown considerable natural gas cost volatility. Fuel cost significantly affect electric production cost and one could argue that assuming $3/MMBtu throughout the life of the combined cycle plant is not realistic.	Sensitivity analysis indicates that even if natural gas costs were to double to $6/MMBtu, the combined cycle model would still have electricity production costs less than that for the wind model. Recommendation is to not redo the analysis.
3	Debt/Equity	Various percentages of debt were assumed for the different plant models. 50% financing	An effort was made to target an average debt coverage ratio of greater than 2:1. The higher debt service costs

		was assumed for the wind project, 60% for the combined cycle project, and 70% for the other three models. Higher debt service would raise production costs.	would apply to two of the fossil fuel models and the hydro model, thus slightly raising their electricity production costs. Some wind project developers attempt to monetize the PTC, which can add to the cash flow available to debt service and boost coverage ratios. These assumptions are reasonable and no further action is required.
4	Tax treatment	Tax treatment for all the models was performed equitably. However, the wind model is the only one that receives a production tax credit (adjusted for inflation) that was extended by Congress through the end of 2003.	The PTC significantly reduces the electricity sales price for the wind model by approximately 30%. The PTC was passed by wide margins in both Houses and is likely to be extended again. However, his PTC could expire and without it wind model electricity prices would increase $19/MWh in the first year to $85/MWh. The analysis is correct and no action is needed.
5	Variability of wind capacity	Oxbow assumed a uniform capacity factor for model 5.	Wind is highly variable, both seasonally and during the day. Wind is also unreliable. Oxbow has made a reasonable assumption, however, wind variability, unreliability, and inability to be "dispatchable" generation capacity could significantly lower the value of electricity from model 5. This should be considered in a future analysis.
6	EPC and O&M costs for Wind Model	ECP assumed for model 5 is $1,961/kW and O&M costs total	Oxbow assumes capital cost of $764M, which is slightly higher than Cape Wind

		$13.35/MWh. ($13.35/MWh is a corrected value from that reported in Table 2—See Table 8.)	Assoc. estimated capital cost of $650 to $700M or $1,650/kW. Wind Power provides some general values for the installed cost of offshore wind at $1,700/kW. However, these costs likely do no include "soft costs" such as insurance, development, permitting, engineering, construction management, start up, finance, debt service, initial working capital, and net interest during construction. Oxbow correctly includes these costs which compares well to a value of $1,900/kW for planned European projects. Wind Power suggests variable O&M costs should be $10/MWh. There is an error in the reporting of fixed operating costs by Oxbow Engineering. The correct value should be $9.05/MWh, which brings total O&M to $13.35/MWh which is a reasonable and defensible value.
7	EPC for Combined Cycle Coal-fired Model	This cost was determined by scaling and older EPC value for a plant built by Oxbow Engineering and costs were then added for escalation and additional required equipment and higher labor costs for the region. The cost was verified from budget prices in the Gas Turbine	This model is the least cost alternative and, therefore, the most likely type of plant that would be built. Actual EPC costs are difficult to obtain in a competitive environment. Based upon personal discussions with another Independent Power Producer, BCG determined that actual EPC costs might

	World Handbook.	be 15 to 20% higher than were assumed. Although significant, this would result in less than a 10% increase in the price of electricity ($46/MWh) needed for this model to provide an equivalent rate of return. Assumed EPC costs for other models are also likely undervalued, thus, the comparative analysis and conclusions are still valid.

Verification of Economic Model

The economic model used in the five cases by Oxbow Engineering appears to be extremely sophisticated and has been used by the company in the past. BCG was informed that some of the models are based upon input and assumptions made for actual power plants that Oxbow has either built or for which it has made cost proposals. As mentioned above, these models appear to include all hard and soft costs and appropriately treat time-based cash flow considerations. Thus, they correspond to very accurate representations of the cost to build, own, and operate these plants.

BCG only had access to the output sheets from the model for this analysis, which provided input values and results. BCG utilized a simplified costing model to verify the results of the more substantial Oxbow Engineering model. BCG conducted an independent analysis of the five different cases using the same input values and assumptions. The results verified that the Oxbow model is correct and accurate in its treatment, calculations, and accumulations of costs.

The BCG model results for the combined cycle case are summarized in Tables 5, 6 and 7.

Table 5
INDEPENDENT COSTING STUDY
APNS Alternative New England Power Projects
Combined Cycle Power Plant
PROJECT COST ESTIMATE

Ref.	DESCRIPTION	QTY.	UOM	UNIT PRICE	EXTENSION	TOTAL	Cost / kW
1	HARD COSTS						
2	EPC, 2 GE 7FA x 1HRSG Steam Turbine	530,900	kW	$410	$217,669,000		$410.00
3	Capital Cost				$235,000		$0.44
4	Contingency		5%		$10,895,200		
5	Total, Hard Costs:					$228,799,200	$430.96
6	SOFT COSTS						
7	Construction Insurance	1	allow	$1,800,000	$1,800,000		$3.39
8	Develop, Permit., and Eng. Cost	1	allow	$6,130,000	$6,130,000		$11.55
9	Construction Management	1	allow	$4,365,000	$4,365,000		$8.22
10	Start Up Cost	1	allow	$5,380,000	$5,380,000		$10.13
8	Financing Costs	1	allow	$4,900,000	$4,900,000		$9.23
9	Land	0	allow	$0	$0		$0.00
10	Debt Service Reserve	1	allow	$5,337,000	$5,337,000		$10.05
11	Working Capital Fund	1	allow	$4,049,000	$4,049,000		$7.63
12	Interest During Construction	1	allow	$2,770,000	$2,770,000		$5.22
12	Total, Soft Costs:					$34,731,000	$65.42
13	Total Estimated Cost:					$263,530,200	$496.38

Table 6
INDEPENDENT COSTING STUDY
APNS Alternative New England Power Projects
Combined Cycle Power Plant
PRELIMINARY CALCULATIONS of OPERATIONS & MAINTENANCE COSTS

ENGINE-GENERATOR NET CAPACITY			
	RAW kW	MULT.	NET kW
ISO Rated	530,900	1.00	530,900
Non-ISO Avg.	530,900	1.00	530,900
Parasitic Loads	530,900	0.98	520,282
To Facility	520,282		

ENGINE-GENERATOR AVIALABILITY			
	HRS.	MULT.	NET HRS.
OneYear	8,760	0.94	8,234
Qrtly Maint.	8,234	1.0000	8,234
Ann. Maint.	8,234	1.0000	8,234
To Facility	8,234		
kWh / Generator / Year Output:			4,371,642,960
kWh / Generator / Year Delivered:			4,284,210,101

NATURAL GAS CONSUMPTION			
	RAW BTU / kWh	MULT.	NET BTU / kWh
ISO Heat Rate	7,043	1	7,043
Non ISO Avg.	7,043	1	7,043
BTU / Yr.	3.079E+13		
MMBTU/Yr.	30,789,481		

OPERATION & MAINTENANCE COST				
ITEM	UNIT COST	UOM	ANNUAL COST	COST / kWh
Natural Gas	$3.00	MMBTU	$92,368,444	$0.02113
Maintenance	$0.003	kWh	$13,114,929	$0.00300
		Total O&M Cost:	$105,483,373	$0.02413

Table 7
INDEPENDENT COSTING STUDY
APNS Alternative New England Power Projects
Combined Cycle Power Plant
DISCOUNTED CASH FLOW, PAYBACK, RETURN on INVESTMENT
CASE 1A - 530.9 MW Gross Output

Project First Cost:	$263,530,200	%Financed	60%
Financed Amount:	$158,118,120	Asset Life for Accel. Depr.:	12
Cost of Money:	9.25%	Discount Rate:	3.5%
Analysis Period (Yr):	12	Annual Load Growth:	0%
Annual Payment:	$22,360,167	Blended Rate:	$0.04220

ITEM	1	2	3	4	5	6	7	8	9	10	TOTAL
INCOME											
kWh per Year	4,284,210,101	4,284,210,101	4,284,210,101	4,284,210,101	4,284,210,101	4,284,210,101	4,284,210,101	4,284,210,101	4,284,210,101	4,284,210,101	
Electricity Rate Transfer	$180,793,666	$180,793,666	$180,793,666	$180,793,666	$180,793,666	$180,793,666	$180,793,666	$180,793,666	$180,793,666	$180,793,666	$1,807,936,663
Tax Liability	($12,188,272)	($12,188,272)	($12,188,272)	($12,188,272)	($12,188,272)	($12,188,272)	($12,188,272)	($12,188,272)	($12,188,272)	($12,188,272)	($121,882,718)
Total Income	$168,605,395	$168,605,395	$168,605,395	$168,605,395	$168,605,395	$168,605,395	$168,605,395	$168,605,395	$168,605,395	$168,605,395	$1,686,053,945
EXPENSE											
Debt payment	$22,360,167	$22,360,167	$22,360,167	$22,360,167	$22,360,167	$22,360,167	$22,360,167	$22,360,167	$22,360,167	$22,360,167	
Depreciation	$13,176,510	$13,176,510	$13,176,510	$13,176,510	$13,176,510	$13,176,510	$13,176,510	$13,176,510	$13,176,510	$13,176,510	$131,765,100
O&M Cost $/kWh	$0.02413	$0.02413	$0.02413	$0.02413	$0.02413	$0.02413	$0.02413	$0.02413	$0.02413	$0.02413	
Annual O&M Cost	$103,373,706	$103,373,706	$103,373,706	$103,373,706	$103,373,706	$103,373,706	$103,373,706	$103,373,706	$103,373,706	$103,373,706	$1,033,737,055
Total Expense	$138,910,383	$125,733,873	$125,733,873	$125,733,873	$125,733,873	$125,733,873	$125,733,873	$125,733,873	$125,733,873	$125,733,873	$1,033,737,055
OPERATING INCOME	$29,695,012	$42,871,522	$42,871,522	$42,871,522	$42,871,522	$42,871,522	$42,871,522	$42,871,522	$42,871,522	$42,871,522	$415,538,710
Discounted Operating Income	$28,655,687	$39,923,033	$38,525,727	$37,177,326	$35,876,120	$34,620,456	$33,408,740	$32,239,434	$31,111,054	$30,022,167	$341,559,743
Discounted Average Income	**$34,155,974**										
Discounted Payback (Yr)	**7.72**										
Discounted ROI	**29.6%**										

Table 5 summarizes the project cost and is taken from the Oxbow model. Table 6 summarizes the O&M calculations and Table 7 is a simple 10-year cash flow analysis. The results from this analysis verify the accuracy of the Oxbow analysis.

The BCG model has significant limitations compared to the Oxbow model and was used only to verify the correctness of the model by an independent means. For instance, the BCG model is not able to include the effects of:

- Capacity degradation
- Off-peak and on-peak power consumption
- Non-fuel O&M costs
- Non-trivial tax considerations
- Escalation on O&M costs
- Differentiation between fixed and variable O&M costs

Thus, the independent economic modeling by BCG is only useful for validating the general accuracy of the Oxbow Engineering model that was used.

Certification of Economic Analysis

BCG certifies that the analysis that it was requested to review is acceptable and that the conclusions are correct.

During the course of this analysis, BCG uncovered minor errors in some of the values provided in Table 1. The Fixed Operating Cost discrepancies were due to a double counting in the margin analysis in models 1, 4, and 5 (Gas-Fired, Hydroelectric, and Offshore Wind). This slight error on the Federal Tax Credit for model 5 appears to have

also been a reporting error. The corrected values are shown in Table 8. These finding did not affect the calculated electricity price for the different models required to provide a consistent rate of return.

Table 8: Certified Values of Cost Analysis and Prices Needed for Power Projects in MA

Technology/ Fuel Source	Electricity Price ($/MWh)	Federal Tax Credit ($/MWh)	Total Construction Cost ($/kW)	Fuel Cost ($/MWh)	Non-Fuel Variable Cost ($/MWh)	Fixed Operating Costs ($/MWh)
Gas-Fired	42.20	0	497.00	21.20	0	3.20*
Coal-Fired	64.00	0	1,480.00	15.20	4.80	11.20
Pet-Coke	55.50	0	1,483.00	5.30	6.30	11.20
Hydroelectric	61.50	0	1,999.00	0	0	8.66*
Offshore Wind	66.00	19.00*	1,961.00	0	4.30	9.05*

*Values found to be in reporting error and corrected by BCG

Conclusions and Recommendations For Additional Evaluation

The analysis and input assumptions for all five models were found to be valid and the calculated electricity priced required for a comparable rate of return for the models was verified. The Oxbow Engineering analysis is a thorough and complete cost analysis that is defensible as a fair and equitable comparison of the Cape Wind offshore power project and four alternative forms of electric power generation in the New England region.

The potentially questionable assumptions in Table 4 are reported for completeness. Many of these assumptions are generous towards the results obtained for model 5. However, BCG does not recommend any changes to the assumptions for Phase 1 are necessary.

BCG is prepared to conduct additional analyses and studies as APNS may feel are necessary. For instance, BCG recommends that a risk analysis of offshore wind energy projects be conducted. This analysis should consider the feasibility of this technology to perform under the proposed conditions, the commercial readiness of large wind turbines, and the reliability of prime movers and electrical equipment operating in harsh environments.

BCG also recommends an evaluation of the problems associated with dispatching wind energy. Transmission system operators will be severely limited in utilizing episodic generating capacity. It may be possible to apply a probabilistic analysis to the reliability and dispatchability of wind power to demonstrate the extremely high variability of project cost and limited benefit to the electrical grid.

BCG is prepared to provide testimony before public or regulatory bodies to defend the analyses, conduct the recommendations mentioned above, and author white papers or other supporting documents, as necessary. However, prior to any Phase 2 work, the specifics of scope, deliverables, and effort will be determined and agreed upon.

It has been a pleasure to perform this work for APNS and I look forward to opportunities to serve APNS.

Sincerely,

Jeff Byron
President

cc: Glenn Wattley

EXHIBIT 6			
Listing of Locations Where BLM Restricted or Prohibited Wind Energy Development			
Source: Excerpts from Attachment B of BLM Record of Decision, *Implementation of a Wind Energy Development Program and Associated Land Use Plan Amendment*, DEPT. Interior (DEC. 2005).			
Idaho			
	Cascade RMP, Four Rivers Field Office	Wind energy development will be restricted from wildlife habitat where adverse effects could not be mitigated.	Restricted areas are not appropriate for wind energy development because of resource management conflicts.
	Jarbidge RMP, Jarbidge Field Office	Wind energy development will be restricted from wildlife habitat where adverse effects could not be mitigated.	Restricted areas are not appropriate for wind energy development because of resource management conflicts.
	Kuna MFP, Four Rivers Field Office	Wind energy development will be restricted from wildlife habitat where adverse effects could not be mitigated.	Restricted areas are not appropriate for wind energy development because of resource management conflicts.
	Lemhi RMP, Salmon Field Office	Wind energy development will be restricted from wildlife habitat where adverse effects could not be mitigated.	Restricted areas are not appropriate for wind energy development because of resource management conflicts.
	Owyhee RMP, Owyhee Field Office	Wind energy development will be restricted from wildlife habitat where adverse effects could not be mitigated.	Restricted areas are not appropriate for wind energy development because of resource management conflicts.
	Twin Falls MFP, Burley Field Office	Wind energy development will be restricted from wildlife habitat where adverse effects could not be mitigated.	Restricted areas are not appropriate for wind energy development because of resource management conflicts.
Montana			
	Garnet RMP, Missoula Field Office	RMP MA 9 will be identified as an exclusion area where wind energy and its associated development will be prohibited.	Wind energy development would be inconsistent with the BLM's management decisions and objectives.
	Garnet RMP, Missoula Field Office	RMP MAs 1, 4, 10, and 11 will be identified as avoidance areas where wind energy and its associated development will be discouraged.	These areas contain important riparian areas; threatened and endangered species habitat; big game winter range; and/or recreation, and historic and cultural sites where wind energy development would be inconsistent with the BLM's management decisions and objectives.

	Judith-Valley-Phillips RMP, Malta Field Office	Wind energy development will be excluded from large reservoirs/waterfowl complexes.	Development will be restricted within 2 mi (3 km) of these sites because of the potential for bird/tower strikes.
		Wind energy development will be excluded from Montana Air National Guard Training sites.	This area is in S. Phillips County and within the Hays Military Operations Area. Wind energy development would conflict with training missions.
		Wind energy development will be excluded from developed recreation sites.	Development within viewsheds will be restricted within 1 mi (2 km) unless topography can screen the project.
		Wind energy development will be excluded from backcountry byways.	Development should not be seen within the viewshed of the byway.
New Mexico			
	Carlsbad RMP, Carlsbad FO	Wind energy development will be restricted in those areas along the face of the Guadalupe Mountains located in the western portion of the planning area and grassland areas in the northwestern portion of the planning area.	This area provides critical habitat for Kuenzlers cactus and Aplamado falcon. Wind energy development in this area would be inconsistent with the BLM's management decisions and objectives for the critical habitat.
		Wind energy development will be restricted in those areas within the viewshed of Carlsbad Caverns National Park.	Carlsbad Caverns National Park receives heavy tourist traffic throughout the year. Because of the significance of the park, wind energy development in the viewshed for the park would be inconsistent with the BLM's management decisions and objectives as well as those of the National Park Service.
		Wind energy development will be restricted in those areas that are within known cave/karst areas within the planning area.	Much of the known cave/karst areas have been designated as "high wind resource levels"; however, wind energy development in this area would have to be restricted because of the numerous cave/karst features in the area.

		Wind energy development will be restricted in those areas that are within the Guadalupe National Backcountry Byway and the Guadalupe Escarpment Scenic Area.	Any wind development in these areas would have a negative impact on the VRM ratings for these areas, which would be inconsistent with current BLM management decisions and objectives.
		Wind energy development will be restricted in designated Special Management Areas.	Wind development in these areas would be inconsistent with BLM management decisions and objectives.
Oregon			
	Andrews/Steens RMP, Andrews/Steens FO	Wind energy development will be restricted from ROW, realty use, and renewable energy avoidance and exclusion zones as identified in the RMP and the portion of the Steens Mountain CMPA in the planning area.	Wind energy development would be incompatible with the purposes and objectives of the special designations (ACECs, WSAs, RNAs, and ONAs) that were identified as avoidance and exclusion areas in the RMP.
	Salem RMP, Salem FO	BMPs and automatic avoidance/exclusion zones included in the Wind Energy Development Program will be adopted.	The BMPs and automatic avoidance/exclusions zones included in the Wind Energy Development Program are appropriate for wind energy development activities in this planning area.
Utah			
	Three Rivers RMP, Three Rivers FO's	Wind energy development will be restricted from rights-of-way and land use authorization avoidance and exclusion zones identified in the RMP and the portion of the Steens Mountain CMPA in the planning area.	the purposes and objectives of the special designations (ACECs, WSAs, RNA, and ONAs) that were identified as avoidance and exclusion areas in the RMP.